EFFECTS OF PROFESSIONAL DEVELOPMENT ON
TEACHERS’ INTEGRATION OF ICT IN TEACHING IN
HONG KONG

Kin Ping Leung

Centre for Mathematics, Science and Technology Education
Faculty of Education
Queensland University of Technology

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Staff Professional Development, Information and Communication Technology (ICT), Teacher change, Integration of technology in teaching, Participatory Action Research, Self-Efficacy, Teachers’ Perceptions of own ICT Skills
ABSTRACT

The introduction of Information and Communication Technologies (ICT) into education has been a major priority of the Hong Kong government since 1997. To help teachers to master the incorporation of ICT in teaching and learning, and to meet the requirements stipulated by the Education and Manpower Bureau (EMB) of Hong Kong, an effective professional development model was urgently needed. Drawing upon research and literature, a school-based program with school-based, on-site and ongoing training sessions collaboratively planned and conducted by peers plus Participatory Action Research mentored by critical friends and peers was carried out in a local primary school and an intervention which lasted two years was designed for the school in an attempt to transform teaching through ICT.

The study involved the collection of both quantitative data, which included teachers’ personal information, their frequency of using computers, perceptions of their ICT skills and self-efficacy toward ICT in teaching, and qualitative data which included interviews, classroom observations, informal conversation, teacher portfolios, lesson plans, textual materials (e.g. brochures, newsletters, websites) and photographs.

A situational analysis revealed that despite incentives such as EMB stipulation on requirements for ICT competence and usage, teachers’ awareness of the advantages of incorporating ICT in teaching, and school support, there were cultural, infrastructural, resource, and personal barriers which prevented teachers from using ICT in teaching effectively. Teachers’ initial relatively low level of knowledge about ICT, the minimal use of ICT in teaching, and low levels of self-efficacy relating to the use of ICT were noted, and teachers readily admitted they were not confident to achieve the EMB goal of using ICT in teaching before the study. Several teachers were identified who were competent with using computers personally but nevertheless their extent of application of ICT in the classroom was limited.

After twelve months, analysis of teachers’ practice revealed that teachers’ frequency of computer use increased significantly in the first and
was sustained in the second year. Teachers became more selective in their use of strategies incorporating ICT in teaching, but the numbers of periods and weeks incorporating ICT increased significantly from the first year to the second year. Though most teachers used ICT teaching strategies compatible with teacher-centred, teacher-directed, exposition approaches, changes of teachers’ practice were shown by an increasing number of teachers using student-centred, student-directed teaching approaches, though the numbers were rather small. Changes in teachers’ beliefs included significant increases in teachers’ perceptions of their own ICT skills and self-efficacy after the intervention. Though their beliefs were not sustained in the second year due to various reasons, there were significant overall increases over the two years. By comparing findings from local research, figures from the current study showed better results.

Qualitative evidence supports the effectiveness of the professional development model in raising teachers’ self-efficacy and technological literacy to a point where they were deemed competent in terms of EMB requirements. Given a focus on technological skill development, advanced understanding of innovative pedagogical practices with ICT was less evident. A number of factors were identified in the study which constrained the development of these practices. The specific experiences of four teachers are presented as individual case studies in this thesis to highlight the range of issues and conditions that impact on the adoption of ICT.

One of the major constraints was related to a highly regulated curriculum based on formalised examinations. The opportunity for teachers to explore alternative approaches to teaching such as innovative ICT strategies were limited by time, and the fear of repercussions from parents and administrators who are concerned about inappropriate activities that would not assist students preparing for examinations. Using two years to change teachers’ practice and beliefs was also a constraint as it was shown that significant changes required much longer time as demonstrated in a similar study overseas which lasted for ten years. The inadequate computer network and poor technological infrastructure also posed constraints for teachers and students.
The findings of this study are presented as a model of professional development, which accommodates the Hong Kong educational situation. It is argued that this model is a successful one for improving teachers’ practice and beliefs in using ICT in teaching in the Hong Kong context.
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SIGNED DECLARATION

The work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously submitted or written by another person except where due reference is made.

Signed: LEUNG Kin Ping

Date: 21 November 2004
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DEDICATION

I would like to dedicate this thesis to my supervisors, Associate Professor James J. Watters and Dr. Ian S. Ginns, my wife Kit, and daughters Vivien and Donmienne, without their encouragement and support, this study would not have been possible.
PAPERS DERIVED FROM THIS RESEARCH

Publication

Conference Papers


CHAPTER 1 INTRODUCTION

1.1 OVERVIEW OF THE THESIS

This thesis reports on the effectiveness of a professional development initiative designed to support teachers incorporating ICT into teaching in a Hong Kong primary school. In particular, the study examines the broader socio-political context, change processes, teacher beliefs and self-efficacy, and levels of technological expertise as elements that promote or inhibit the successful integration of ICT in this particular situation. Both qualitative and quantitative data are used to examine these issues.

There are eleven chapters in this thesis. Chapter One sets the scene of the study by reviewing the development of ICT in education internationally and specifically in Hong Kong, and contextualising the needs of the teachers, the principal, and the researcher’s involvement in the development of ICT in education. The research questions and significance of the study are also presented. Chapter Two examines the literature on the broader context of education in Hong Kong, which highlights specific educational problems and approaches that impact on the adoption of ICT in education. The chapter reviews the literature in three areas. Firstly, the advantages of incorporating ICT in teaching and learning are explored with specific reference to successful examples. Secondly, as the study involves school teachers, theories on motivating teachers to change are also examined. Thirdly, literature on effective staff professional development is also reviewed to guide the study and inform the professional development strategies. A framework drawing upon all three areas is thus developed for the study. Chapter Three provides details about the research design and methods of the study. The limitations, issues, and research ethics are also previewed. Chapter Four summarises the findings of a contextual analysis of three areas, namely, the information about the school, the incentives that influence teachers to embed ICT in teaching and the barriers experienced that constrain teachers from embedding ICT. Chapter Five provides and analysis of quantitative data that describe the changes in teachers’ use of ICT, their perceptions of their skills and their sense of self-efficacy in using ICT in
teaching. To provide rich insights into a complex situation, Chapters Six to Nine presents the qualitative component of the study. Each of these chapters is a case study of a particularly selected teacher. Chapter Ten supplements the four cases with further evidence to illustrate the arguments. In the light of the literature, supported by evidence from the study, Chapter Eleven reviews the achievements of the study, provides suggestions for further research and presents implications of the study for practice. The problems and issues are identified and an effective staff professional development model is postulated.

1.2 CHAPTER OVERVIEW

This first chapter looks at how various countries have reformed their educational systems in response to the proliferation of computers, email, Internet, video conferencing and so on. This overview will be followed by an exposé of the vision and initiatives of academics to capitalise on computers and IT in education, and the policies developed by various countries to promote IT in education. The concerns of the principals and teachers and their needs for professional development on IT per se and IT in education are examined to answer the question of why such a study had to be undertaken. The research questions are presented and the indicators identified that enable these questions to be answered. The significance of the study is also discussed.

1.3 COMPUTERS AND ICT ENHANCE COMPETITIVE WORKFORCE

Computers have been used extensively in offices, factories, companies, schools and home and proliferated in all walks of life (Brosnan, 1998) because the functions, speed and capabilities of computer hardware and software have improved dramatically. Computers are now able to present detailed and colourful graphics at a very high speed and can handle huge amounts of data for easy storage, retrieval and processing. The burgeoning applications of the computer and related technologies in acquiring, selecting, analysis, storing and transmission of information, and advanced software packages such as the productivity software has become more user-friendly and versatile using the Graphical User Interface (GUI). With the advances
made in network and peripheral design, computers are no longer stand-alone processors, but are networked together within LANs and globally through the Internet. Knowledge of and skills in using computer and IT have become indispensable as a member of the globally competitive workforce (Kemp, 1995; Roblyer & Edwards, 2000).

Governments of various countries have perceived the importance of ICT knowledge and skills to their future workforce, they have promoted ICT (Australia, 1997; Canada, 1994; Japan, 1994; UK, 1995-96; USA, 1997) and implemented ICT curricula to train their younger generations so that they can produce a competitive workforce in the global competition (BoS, 1994; BSSSS, 1998; Curriculum Council, WA, 1998; CSF, 2000; GCSE, 1996).

Hong Kong is no exception. In the inauguration policy address of the Chief Executive of the Hong Kong Special Economic Region (HKSAR), Mr. Tung Chee Hwa pledged to make Hong Kong a leader, not a follower, in the information world of tomorrow (Tung, 1997) through the promotion of ICT and ICT in education.

1.4 COMPUTERS AND ICT ENHANCE TEACHING AND LEARNING

Besides having an impact in industry and commerce, computers and IT have also impacted on education. Educators have broadened the emphasis on computers in education to acknowledge the power of the technology in the acquisition of knowledge. Hence the term Information Technology (IT) has been adopted in many countries to describe and encompass the range of applications of computers in education. An analogous term, Educational Technology, is used in the U.S.A. (ISTE, 1998, 2000; Roblyer et al., 2000). The increasing demand for Internet services is attracting commercial interests to provide information on the “Net” which will further stimulate the sale of computers in the domestic market. All of these features have opened up many different possible applications of computers in teaching and learning such as simulations, educational and adventure games, cyber schools and virtual reality. In Europe, communication is considered as an important component of Information Technology, so it is also called Information and Communication Technology (ICT). However, in Hong
Kong, the common term is IT instead of ICT, as in IT Coordinator, IT Team, IT Competence, and so on. In Australia, there are people using ICT (Dowling & Lai, 2003; Schwarz, 2004) but there are also people using IT (Australian Library and Information Association, 1992; Defence Signals Directorate, 2004; QUICK, 1981-2004). For simplicity and parsimony in words, the term Information Technology (IT) is used on some occasions to include the broader sense of Information and Communication Technology (ICT). Elsewhere the terms IT and ICT are used interchangeably depending on the context.

The following sections present the visions of the researcher, the educators all over the world, the government of various countries, and the Hong Kong government. The IT strategy of Hong Kong is discussed in more detail to illustrate the pressing needs of the schools, the principals, and the teachers.

1.4.1 THE RESEARCHER’S VISION OF COMPUTERS IN EDUCATION

After building his Motorola D1 and D2 microcomputer kits in 1977 and expanding them into full computer with TV as output monitor and QWERTY keyboard as input device, the researcher loaded some games written in BASIC computer language and found his students fully absorbed in playing these games. He believed that the interactive style of games would be a very useful way of engaging and assisting students in learning. He envisaged the impact of computers on education, and began to persuade teachers to consider using computers to teach through disseminating computer knowledge among them (Leung, 1980).

When the researcher taught Advanced-Level Physics at a high school in Hong Kong, he believed that simulations of waves would help students to master the concepts of superposition of waves in single-slit diffraction, double-slit interference and diffraction grating. Besides using a ripple tank to simulate the phenomenon with water waves, he asked his students to draw sets of concentric circles with different colours to indicate troughs and peaks of waves from different sources on different transparent papers. By placing one paper on the other, the intersections of the two sets of concentric circles
simulated the superposition of waves and showed the patterns of interference. As the power of the CPU, display card and programming language were rather primitive at that time, he could only dream of displaying the movement and superposition of waves coming from different sources in animation mode. In around 1999, a former student told him that these simulation programs were available on the Internet for teachers to download and use in their teaching (Vtorov, 1996). After some searching, he discovered there were websites, for example, NTNU Virtual Physics Lab (Hwang, 1998) which offered simulations on various topics in physics for teachers to facilitate their students’ learning and enhance their understanding of difficult concepts. Using a search engine, teachers can find many related websites that they can use, for example Doug Craigen’s Physics Pages (Craigen, 2001), Physics Department, Boston University (Duffy, 2002), Physics 2000 (2002).

The researcher was one of the first teachers in Hong Kong to learn about microcomputers and promote their educational use. He has been intensely involved in the development of, and teaching with, computers and IT in Hong Kong for over two decades (Leung, 1980, 1983, 1984a, 1984b, 1985a, 1985b, 1986; Leung & Chui, 2001; Leung & Kong, 1996; Leung, Kong, Chung, Ki & Wong, 1996; Leung, Pun, Kong & Tsoi, 1997). It has been his mission to help teachers master the knowledge and skills of using IT in teaching and learning.

1.4.2 EDUCATORS TRY TO CAPITALISE COMPUTERS AND IT IN TEACHING AND LEARNING

Educators are researching the possibilities of integrating computers into teaching to make teachers’ teaching and students’ learning more effective. Different forms of computer-assisted learning programs that draw upon a constructivist paradigm of learning have emerged. Besides word-processors, spreadsheets, database, graphics, presentation packages, educational simulations and games, the popularisation of the Internet has attracted many educators to trial the use of the Internet in teaching and learning.

Educators at Ontario Institute for Studies in Education (OISE) at the
University of Toronto, Canada, have been doing research on Computer-Supported Intention Learning Environment (CSILE) and Situated Learning (CSILE, 1996) with emphasis on using IT to develop learning communities. There are other studies being conducted, such as Collaborative Learning Environment (CLE) at Pennsylvania State University (Courseware Development Group, 1998), Virtual Learning Community (VLC) at Washington University (VLC, 1999), and Simulation and Virtual Reality (VR) at MindSpring Company in the United States of America (Rigole, 1996). Educators at the Faculty of Education, Queensland University of Technology, Australia, and 89 schools across Australia, investigated the ways Australian primary and secondary teachers of Literacy, LOTE, Mathematics, Numeracy and Science were identifying, storing, using, reusing and sharing online resources with a view to identifying: patterns of usage; profiles of special groups; teaching and learning strategies appropriate in the online environment; strategies for targeting the identified groups with online curriculum content; and barriers to the full adoption of online curriculum content (Cooper, 2001).

1.4.3 GOVERNMENTS PROMOTE COMPUTERS AND IT IN EDUCATION

Teachers around the world are also trying to use computers in order to improve their teaching and students’ learning (Law, Yuen, Ki, Li, & Lee, 1999). There are different ways of integrating computers in teaching. In the United States of America many schools experimented with different models of integrating computers in the classroom (Bullough & Beatty, 1991; Evans-Andris, 1995; Evert, 1995; Gooden, 1996; Hadley & Sheingold, 1993; Sandholtz, Ringstaff & Dwyer, 1997; Sheingold & Hadley, 1990; Sheingold, Kane, Endreweit, & Billings, 1981). In Australia, some private schools experimented with the integration of portable computers in classroom teaching (McDougall, 1995). In fact, from the researcher’s observations in two primary schools in Victoria from 1993 to 1995, computers were commonly used in classrooms, for word processing in writing assignments, using the Internet for acquiring information for projects and writing emails for communication in lower grade classes. The Board of Studies of the Ministry of Education of Victoria, Australia, prepared a Curriculum and
Standards Framework (CSF, 1995) in computer education for all secondary and primary schools in Victoria. There were also corresponding professional development programs accompanying the framework. Cole (1997) reported the classroom management models for integrating computers in the curriculum in Queensland. To prepare the students for the Information Age, Education Queensland initiated the Schooling 2001 project to introduce competency standards for teachers and published the Schooling 2001 (Peach, 1997), which was better planned. There were also systemic support programs for the introduction of the standards. There has also been research on the types of usage of computers in teaching in Korea (Jo, 1996), Malaysia (Abas, 1995), the Netherlands (Veen, 1995), Switzerland (Hurst, 1995) and the United Kingdom (Aston, 1995; Olson, 1995; Watson, 1994). As the world geared up for IT Integration in Teaching (Johnson, Maddux & Liu, 2000; Pelgrum & Plomp, 1991), it is interesting to examine what had been happening in Hong Kong.

1.4.4 INFORMATION TECHNOLOGY IN EDUCATION: A MAJOR PRIORITY IN HONG KONG

The Hong Kong Government had recognised the adoption of IT in teaching and learning as a high priority area and a number of initiatives have been implemented. Four key enabling factors, namely, high capacity hardware, a common software interface connecting all communication networks, IT competent people and a creative stimulating cultural environment were identified. A five-year IT education strategy was launched to promote the use of IT to enhance teaching and learning (Tung, 1997).

The main tasks were “to equip our teachers with the necessary IT skills; to apply computer-assisted teaching and learning across the curriculum; and to place students in an environment where they can use this technology as part of their daily activities and grow up to use it creatively” (Tung, 1997, p. 46). It was expected that within the next five years, teachers in Hong Kong would teach at least 25% of the curriculum supported through IT. Within ten years, the Hong Kong government aims to see IT being applied comprehensively in school life, and all teachers and secondary school graduates in Hong Kong being able to work competently with IT tools (Tung,
1997). It was also promised, within the school year 1998-99, (1) that the number of computers would be increased from 15 to 40 and from 20 to 82 on average for each primary and secondary school respectively; (2) new software supporting teaching would be procured or developed; (3) 30,000 teachers would be trained in IT use; (4) an IT Education Resource Centre would be set up to support management of school IT systems; (5) pilot schemes in 20 schools to establish best practices for IT applications in teaching and learning would be introduced; (6) all schools would be connected to the Internet; and (7) an education-specific intranet for multi-dimensional communication and sharing of information within the school sector would be prepared (Tung, 1997).

1.4.5 INFORMATION TECHNOLOGY FOR LEARNING IN A NEW ERA

The results revealed in the researcher’s Hong Kong Primary School Teachers’ Self-efficacy in Using Computer-Assisted Teaching Survey (Leung & Chui, 2001) that teachers’ incompetence and a lack of hardware and software, were confirmed by the government in its formal document (EMB, 1998). The Government recognised that there was a poor IT culture in schools, and most teachers had little experience in using IT to teach, partly due to lack of training opportunities and facilities. The level of accessibility of the average student to a computer and the Internet was also not very high. So in 1997, the Hong Kong Government announced a series of initiatives costing (HK)$2,880 million in capital cost and (HK)$260 million in annual recurrent cost (EMB, 1998). In the 1998 Policy Address, the Chief Executive announced a further set of initiatives at an additional capital cost of (HK)$334 million and an annual recurrent cost of (HK)$294.5 million (EMB, 1998).

After two months of public consultation, the Education and Manpower Bureau published the Information Technology for Learning in a New Era, Five-Year Strategy 1998/99 to 2002/03 in November 1998 which proclaimed the government’s vision and missions in promoting IT in education, and identified the key components corresponding to the missions.

The government’s vision in promoting IT in education is, through
harnessing the powers of IT:

- To turn our schools into dynamic and innovative learning institutions to enable students to become more motivated, inquisitive and creative learners;
- To enable students to acquire a broad knowledge base and a global outlook by linking them with the Internet;
- To develop students’ capabilities to process information effectively and efficiently; and
- To develop in the students the attitudes and capability for independent life-long learning (EMB, 1998).

The corresponding strategies to accomplish the government’s vision were to:

- provide adequate IT facilities for students and teachers to access information;
- encourage key players, notably teachers, to take up the challenges;
- integrate IT into school education; and
- foster the emergence of community-wide culture change (EMB, 1998).

Key components in the strategy were identified as:

- Access and Connectivity – the government provided schools with more funding flexibility to ensure students have a sufficient level of hardware and more access to the Internet;
- Teacher Enablement - to prepare teachers to take up the role as a guide and facilitator through training and technical and professional support and to ensure all inservice teachers reach at least the “basic” level of IT competency by the 2000/01 school year, and about 75% of teachers reach at least the Intermediate IT (IIT) level, about 25% of teachers reach at least the Upper Intermediate IT (UIT) level, and one or two teachers in each school reach the Advanced IT (AIT) level at the end of 2002/03 school year. Teachers were provided with opportunities to have IT training;
• Curriculum and Resources Support - to achieve the target of improving the delivery of the existing curriculum, teachers were required to set 25% of teaching the school curriculum supported through IT;

• Community-wide Culture – schools and teachers were required to collaborate among the school management, teachers, students, parents, the business sector and other community bodies to work towards the government’s missions and ultimate vision of IT in education”. (EMB, 1998).

To enable schools to make early preparation for the implementation of the IT in Education initiative for the 1999-2000 school year, all government funded primary, secondary, and special schools were provided with recurrent grants to support the implementation of IT in education initiative. The amount of recurrent grant for each primary school was dependent on school type, as shown in Table 1.1 (Education Department, 1999g).

Table 1.1
*Government recurrent grant for the year 1999-2000.*

<table>
<thead>
<tr>
<th>Primary</th>
<th>ITEd* Grant</th>
<th>MMPS Grant</th>
<th>Total Amount (HK$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi-sessional school (each school)</td>
<td>$33,000</td>
<td>$14,000</td>
<td>$47,000</td>
</tr>
<tr>
<td>Whole day school</td>
<td>$55,000</td>
<td>$14,000</td>
<td>$69,000</td>
</tr>
<tr>
<td>IT pilot school</td>
<td>$71,000</td>
<td>$14,000</td>
<td>$85,000</td>
</tr>
<tr>
<td>Bi-sessional school with the other session being a pilot school</td>
<td>$11,000</td>
<td>$14,000</td>
<td>$25,000</td>
</tr>
</tbody>
</table>

* Here ITEd stands for Information Technology in Education Project and MMPS stands for Multi-media Computers for Primary Schools Project.

1.5 WHY CONDUCT THE STUDY?

Although there is a clear mandate for the introduction of IT as described in the previous section, schools, principals and teachers were not ready for the sudden influx of a large amount of computer hardware and software. In fact, researchers overseas reported that existing computers in schools were under-utilised in their respective countries (Cuban, 1986, 2001; Marcinkiewicz, 1993; Marcinkiewicz & Welliver, 1993; Sheingold & Hadley, 1990). There were some anecdotal stories relating to situations such as “computers in the church” and “computers in the toilet” in the early stage of computer implementation in 1998 in Hong Kong. Many student teachers
who did their teaching practice in 1999 at various primary schools in Hong Kong, reported that they did not have computers to use in their teaching. It meant that, because of the limited space in primary schools, computers were not properly accommodated so that they could be properly used.

1.5.1 SCHOOL PRINCIPALS’ CONCERNS

As the birth rate in Hong Kong declined in the past several years (Index Mundi, 2004), visionary principals were alerted of the danger of school closure due to insufficient number in pupil intakes. The implementation of the IT in education pilot scheme of ten primary and ten secondary schools in 1998 had established the image that IT rich schools are better schools, so many principals wanted to capitalise on government’s IT in education policy by setting up a computer room and multimedia language laboratory, and advertised the school as an IT rich school by placing banners around their schools to encourage parents to send their children to the school. On their websites in the Hong Kong Education City (HKEdCity, 2001), there are still schools claiming excellence on facilities (Bonham Road Government Primary School, Buddhist Wing Yan School (A. M.), Carmel Alison Lam Primary School, Immaculate Heart of Mary School, C. U. H. K. F. A. A. Thomas Cheung School, Y. O. T. Tin Ka Ping Primary School).

As more schools acquired computer facilities, principals then embarked on new initiatives of implementing IT in teaching and learning. They wanted their teachers to be able to use IT effectively in teaching, and students to learn effectively using IT. Implementing an IT-based teaching platform and incorporating IT in cross-curricular teaching and learning with database of online teaching resources have became popular approaches in schools in Hong Kong, as can be seen in some school websites hosted by the Hong Kong Education City (HKEdCity, 2001), for example, Baptist (STW) Lui Ming Choi Primary School, Hong Kong and Macau Lutheran Church Primary School, Li Sing Primary School, Po Leung Kuk Tin Ka Ping Millennium Primary School, Tai Po Old Market Public School, Y. C. H. Choi Hin To Primary School.

Principals of schools had to ensure their teachers had attained the
required IT competence by the end of academic year 2002/03 and teachers have used IT in 25% of their teaching from the year 2003. So principals wanted to have training programs that could help teachers master IT skills to complete their portfolio, and use IT in their teaching. It was no less the case with the teacher of the school that forms the focus of this thesis.

The principal of Philanthropy Primary School (pseudonym) wanted to give the school a reputation of being IT rich and integrating IT across the curriculum, so she persuaded teachers in the school to embark in the adventure of learning IT to reach the required competency levels as well as to incorporate IT in teaching. It was within this context, that the researcher formed a relationship with the school to support the development of IT in teaching.

1.5.2 SCHOOL TEACHERS' CONCERN

A teacher deficit model (Watkins & Biggs, 2001) has been popular in Hong Kong. Teachers are blamed for school leavers’ low achievements in English and Chinese. In order to sift the incompetent language teachers, teachers teaching English and Chinese, no matter whether they are teaching lower primary or senior secondary schools, have to take the same Language Proficiency Assessment (LPA) so as to reach the same benchmark for teaching the language. Teachers failed in the assessment may not be able to get continuation of employment as a language teacher (EMB Circular Memorandum, 311/2003, 165/2004). The benchmarks and assessments have been discussed for some years and created a lot of pressure on teachers, especially those who are senior and experienced.

After the announcement of the Five-year IT Strategy, EMB wanted to implement competency assessment tests for teachers too (Education Department, 1988a). However, the group of academics responsible for the consultancy believed that through training and hands-on practice in building up the teachers’ own portfolio was a better way to enable and empower teachers in using IT in teaching than by a one off examination (Au, Kong, Leung, Ng, & Pun, 1999).
We believe the essence of IT in education is to enable and empower our teachers to apply IT in learning and teaching situations, which will in turn benefit our next generation. We should encourage and assist teachers to integrate IT in education rather than setting up barriers. The introduction of a certification system at this point in time merely provides an extra hurdle for our teaching profession. In particular, it will create a lot of undue pressure and stress on some teachers who are real novices in using IT in education. Arguably, we should be doing all we can to remove the hurdles and reduce the stress for these teachers rather than creating more. (p. 49)

Though teachers did not need to take the assessment in IT competence like LRA, they were still required to complete their portfolio and send it to their principals by email. Therefore the first concern of all teachers was the ability to complete their portfolio. There were also teachers who wanted to master IT skills so that they can teach more effectively.

1.5.3 THE RESEARCHER’S VISION OF IT IN HELPING TEACHERS AND STUDENTS AND HIS MISSION TO PROMOTE IT IN SCHOOLS

As an advocate of computers and IT in education the researcher, a teacher educator, and the chairperson of the IT in Education Group of the Hong Kong Professional Teachers’ Union, had the opportunity to meet and discuss the uptake of technology with teachers on various occasions such as at workshops, seminars and conferences. Many teachers in Hong Kong expressed concern about using computers in their teaching because they did not see any benefits in using computers over their current practice. They had the experience, pedagogical skills, management skills and the familiar environment, as well as the status of a knowledgeable person in the traditional classroom without a computer. If they were to use IT or computer in their classrooms, an approach which they knew very little about, or were uncomfortable with, they feared a loss of status, hard-learned teaching and class control skills, and familiar teaching procedures and environments in which they had confidence, as some teachers in the United States of America had found (Marcinkiewicz, 1993).

Concern about teacher knowledge was highlighted by Brosnan (1998) who wrote,

An increasing computing and Information Technology (IT) presence throughout almost every aspect of contemporary life, one might expect that as computers permeate more dimensions of society, people will
become more familiar with, and more confident in, their interaction with computers, possibly reflected in increased applications for computer science courses. However, this is not the case. (p. 3)

Rosen and Weil (1995) identified that at that time in the United Kingdom only one-third to two-thirds of all teachers used computers actively in their teaching. Many teachers felt ill prepared and resisted the integration of IT into teaching (Pina & Harris, 1993). Similarly the researcher noted that when IT was promoted by the government in 1997/98 there were many teachers in Hong Kong with negative attitudes towards computers, claiming often that they were “machine-blind”. They acknowledged they were ignorant of the potential of computers and did not believe that they could manage to integrate computers into their classroom teaching and teach well.

However, it is stipulated in the formal document that teachers have to use IT in 25% of their teaching (EMB, 1998, p. 16, 31). This is one of the targets of the five-year education reform (p. 13). Teachers of all schools, primary or secondary, government, grant or subsidised, have to follow this direction. Though the Education Department had organised many seminars and workshops for teachers (Education Department, 1999a, 1999b, 1999c, 1999d, 1999e, 199f), teachers’ great concern was still the ability to use IT effectively in their classroom teaching. As a promoter of IT in education and organiser of teachers’ professional development initiatives, these concerns were the foundation of the researcher’s study and research questions.

1.6 AIMS OF THE STUDY

As mentioned in previous sections, the Hong Kong government mandated that all teachers in Hong Kong should spend at least 25% of their teaching time using IT in teaching by the academic year 2002/03. By injecting a huge amount of funding for hardware and software acquisition, and teacher training, the government assumed that there would be substantial beneficial outcomes. Although schools rapidly acquired the hardware, teachers continued to complain about the quality of training provided to support the use of the technology. Because these training programs were off-site, one-shot seminar types, some with hands-on practical sessions in the laboratory of the institutions providing the training, teachers complained
that they could not use what they learned when they returned to their own school. Hence teachers sought a school-based training model. Whether school-based training conducted by colleagues could help teachers in the same school, especially in primary schools, to master the concepts, knowledge and skills of using IT in teaching had not been researched in the Hong Kong context. Thus it was necessary to conduct studies aiming at finding out an effective staff development model that could make an impact on teachers’ incorporation of IT in their teaching. This study emerged out of a need to explore these issues. Hence, it was designed investigate how a professional development initiative can make an impact on teachers to develop their competence and confidence so that they can become frequent and effective users of IT in their teaching. It also tries to describe, explain and theorise the changes in teachers’ practice after the staff development initiative.

1.7 THE RESEARCH QUESTIONS

Aiming at finding an effective staff development model that can make an impact on teachers’ incorporation of IT in their teaching, the research questions of the study are:

1) What are the antecedent and contextual factors that influence current practice?

2) What are the effects of a professional development initiative on teachers’ integration of IT in teaching?

The following indicators or sub-questions were used to investigate the effects of the professional development initiative:

i) What will be the change in teachers’ perception of their IT skills as a result of the intervention?

ii) What will be the change in their self-efficacy as a result of the intervention?

iii) What are the teachers’ common strategies in using IT in their teaching?

iv) What are the changes in teachers’ practice?
Informed by both the literature and the outcomes of research questions 1) and 2), an effective professional development model will be postulated.

1.8 SIGNIFICANCE OF THE STUDY

From the discussion above, the proliferation of computers and the popularisation of the Internet have formed the tsunami of IT, which is having overwhelming effects on education globally and in Hong Kong. The Hong Kong government has decided that IT should be integrated into education and therefore has allocated a large amount of funding for this purpose. It has profound significance because it involves cultural changes that shake the foundation of the subject-based and examination-oriented education system. From the seminars and workshops organised by the government and documents published by the EMB (Curriculum Development Institute, 1998), teachers are encouraged to move from the teacher-centred, behaviouristic, rigidly-scheduled teaching content and examination-driven teaching environment into the student-centred, problem-oriented, collaborative-learning, situated learning type of contemporary teaching approaches. However, because of the inertia of the education system (Sandholtz et al., 1997) as well as the lack of knowledge and research support, principals and teachers of Hong Kong schools are not quite sure how to promote the integration of IT into teaching. They needed advice and guidance on the adoption of computers and IT in teaching. Hence a theoretically justified and empirically validated model of professional development was necessary.

Drawing upon both the literature and outcomes of the study a theoretical model for effective professional development and support for innovation in IT is proposed. The model can be implemented in other schools so that teachers are able to capitalise on the experience and theoretical frameworks provided by this study. Regional and central networks can be implemented so that the experience can be shared among teachers of all schools in Hong Kong.

1.9 CONCLUSION

From the discussion above, the urgent need for an effective staff
development model to raise the standards of teachers’ knowledge, skills and techniques in IT and IT in teaching was established. This study has developed out of a desire to help teachers to adopt IT in teaching in Hong Kong and to contribute to a better understanding of professional development models. It is proposed that the model explored in this study will help reveal inform policy makers, principals and teachers who wish to embed technology. The research also contributes to a better theoretical understanding of professional development in the Hong Kong context. As there are countries like China, Taiwan, Macau and others, which still use subject-based, examination-oriented education systems similar to that in Hong Kong, the research findings and theoretical frameworks will be applicable to their schools.
CHAPTER 2 LITERATURE REVIEW

2.1 CHAPTER OVERVIEW

The need for an effective professional development model to help teachers use IT in teaching were established in Chapter One. It is necessary to review the literature demonstrating the views of some opponents and some successful examples of using IT in teaching and learning. The advantages of using IT in teaching and learning are also studied and summarised. As the study is performed in Hong Kong, the context of education in Hong Kong is also studied to identify the factors which may affect the implementation of IT in teaching and learning. Motivation theories will be examined to select an appropriate theory to guide the study. Since the study is on staff professional development, literature on staff development is also reviewed to select the best models to inform the current study. The chapter concludes with a summary of the literature reviewed.

2.2 OPPONENTS OF USING IT IN TEACHING AND LEARNING

While many researchers and teachers are keen to promote IT in teaching and learning, there are academics, researchers and teachers who oppose applications of computers and IT in teaching and learning (Bearman, 1997; Cheung, 2002; Koo, 2002; Tsui, 2002; Yelland, 2001). Opponents to IT argue that the huge funding for the purchase of hardware and software, maintenance, upgrade, and teachers’ professional development can be better used for other “worthwhile” education expenditures, on for example, new textbooks, music programs, vocational education, and the arts. It was found that “computers may not have the effect on academic achievement in reading that someone may expect, even when they are used by well-trained instructors” (Johnson, 2000, p. 9). Many of the arguments against using IT in teaching and learning are based on the deployment of critical resources (Yelland, 2001). They are preoccupied with cost and productivity (Albright, 1996). Bearman (1997) presents more arguments such as (1) The computer is not personal and the feedback is very limited; (2) Not all students have appropriate access to hardware and software which may limit the scope of teaching; (3) The cost of high quality CAL is very expensive which is not affordable; (4) Simulations are not the real thing, and
students need to have real hands-on experience, (5) Computers are not books, and it is difficult to read from a computer screen; and (6) Many students, particularly mature-age students, may be lacking in IT skills.

Teachers complain that using IT in teaching is time-consuming for class preparation (P.S. Leung, 2002; Man, 2002; Sham, 2002) and development of teaching materials (Ki, 2002; Tsui, 2002), and it takes time to adapt (P.S. Leung, 2002).

Some people believed that the same amount of money could reduce class sizes by a one-third and foster considerable professional development for effective teaching. The results of a research by economist Levine and his associates that “students teaching students (peer tutoring) emerged as far more cost-effective than computer-assisted instruction. CAI was slightly more cost-effective than reducing class size from thirty-five to thirty or even twenty students” (Cuban, 1986). Equipping schools with computers may be expensive, but the purchase is a once only payment. Maintenance expenses and consumables are small compared to a reduction of class size because staff costs are recurrent and expensive.

Technology did not make a major impact in schools in the early days because of the primacy of content over pedagogy (Means & Owens, 1994). The simulations and intelligent tutoring systems were largely ignored because they were relevant to only a small part of existing curricula, and were not essential to content in state curriculum documents (Yelland, 2001). “Classroom implementation varied greatly from school to school and from teacher to teacher, because teacher beliefs, community expectations, and structures of age-graded schools, then and now, have been slow to change” (Cuban, 2001, p. 154). Achieving a meaningful use of the technology is a slow process influenced by many factors including many barriers (Ertmer, Addison, Lane, Ross & Woods, 1999). Even in a pilot scheme lasting one to two years, with the research conducted in a limited time, remarkable change in students’ achievement is sometimes difficult to be observed (Law, 2000).
2.3 SUCCESSFUL EXAMPLES OF USING IT IN TEACHING AND LEARNING

After reviewing arguments opposing the use of technology, some successful applications of IT in teaching are explored.

2.3.1 IMPLEMENTING IT IN TEACHING HAS ACHIEVED GOOD RESULTS FOR TEACHERS

In one professional development program the team members from a tertiary institute went into the classroom and taught the lesson with assistance from the respective classroom teacher. The teachers continued or followed up the initial lesson with activities of their own. These classroom team-teaching activities were highly successful because teachers used computers more in their teaching activities and continued throughout the project as more software programs were introduced (Schmidt, Sasser, Linduska, Murphy & Grether, 1999). The observation agrees with Bandura’s (1977b) theory of vicarious learning and performance accomplishment. The interviews of teachers in schools participating in the IT in Education Pilot Scheme in Hong Kong showed that interactive presentations saved their teaching time and enhanced the efficiency and effectiveness of teaching. The time saved could be used to encourage students to study further independently (Kong & Pun, 2000).

Law (2000) found that in the IT in Education Pilot Scheme in Hong Kong “both teachers and students have variously also gained in their mastery of IT skills. When the focus was on technology supported teaching, the teachers were all generally more competent, and many of them have mastered the skills of multimedia production and programming” (p. 172). Kong and Pun (2000) also found that “the integration of IT and curriculum is the main force in promoting the full acceptance of information technology by teachers and students” (p. 69)

2.3.2 IMPLEMENTING IT IN TEACHING HAS ACHIEVED GOOD OUTCOMES FOR STUDENTS

There are research projects on integrating IT in teaching and learning which have been positive for students in terms of their motivation, collaboration, and learning outcomes. The following are some of these examples.
2.3.3 IMPLEMENTING IT HAS SHOWN IMPROVEMENT IN STUDENTS’ MOTIVATION

Dix (1999) investigated the effectiveness of technologically-based instruction in secondary school mathematics, by comparing students’ achievements resulting from technology-rich assignments with those achievements resulting from equivalent assignments presented in traditional format. She found that, although there is no significant difference in achievement with either method, use of computers in mathematics does appear to positively influence student motivation.

In using databases and spreadsheets to teach primary students, Brosseuk (1998) found that using a real life context enhanced the teaching and learning in an enjoyable and practical way, and developed students’ general thinking processes and problem solving skills. Students were enthusiastic and fascinated when using the electronic tools to solve problems.

The following examples from research on student teachers are applicable to primary and secondary students. Diezmann and Watters (2002) found clear evidence that students appropriated IT resources as tools to construct an understanding of the teaching-learning process in science. Being able to access and revisit resources over time had the potential to strengthen effectiveness and heighten students’ interest in science teaching. Although the project included pre-service and in-service teachers, the experience of using CD ROMs in teaching and learning applies equally well in primary and secondary schools (Kong & Pun, 2000). In a study of the impact of the Internet on teacher practice and classroom culture, Green and O’Brien (2002) found that students were engaged when accessing the Internet. Girls were comfortable searching for information on the Internet and reading multiple pages of text, and were likely to take the time to read what they found.

2.3.4 INCORPORATING IT IN TEACHING IMPROVES STUDENTS’ UNDERSTANDING

Computer software is good for presenting colourful graphics in three-dimensional space. This helps to model abstract ideas and simplify complicated diagrams. Computers have been used in the teaching and learning of mathematics with significant results. A teacher has been working on
presenting the theorems of geometry contained in the classic textbook “A New School Geometry” by Durrell (1939) on the web. Students can explore the properties of the figures of these theorems by themselves. For example, in Theorem 43 of Chords and Circles, students can move the points on the circumference to vary the position and length of the chord, and investigate the distances from the intersection of the perpendicular to the points on the circumference interactively. The computer redraws the figure every time the student moves the point. The clarity and interactivity are not possible when hand drawing the figure on the chalkboard (W.K. Leung, (n.d.)).

Vincent and McCrae (1999) investigated the progress of geometric understanding of twelve 11-12 year old girls in a private girls’ school in Melbourne, using Cabri geometry. The girls each had their own notebook computers but had not used the software before. The study suggested that Cabri can result in significant progress in understanding of geometric properties and relationships even after relatively few lessons.

After analysing applications of IT in various schools and projects, Jonassen, Peck and Wilson (1999) grouped these learning activities around several mindtools, which can be used by teachers to enable students to learn effectively. These are Databases, Semantic Networks, Visualisation Tools, Microworlds, Expert Systems and Mental Models.

2.3.5 INCORPORATING IT IN TEACHING ENHANCES STUDENTS’ COLLABORATION

The construction of knowledge by a group of primary students in Queensland was enhanced when they worked collaboratively in a small group to generate a format-free computer database. It was a very effective way of establishing a knowledge building community within a primary school classroom (Nason, Lloyd & Ginns, 1996).

2.3.6 INCORPORATING IT IN TEACHING ACHIEVES BETTER GRADES

Experience in UK has found that there was a consistent trend for pupils in schools with better IT resources to achieve better grades for English, maths and science. It also indicated that schools that used IT to support a particular subject, tended to achieve better in that subject than schools which did not use
2.3.7 ONGOING INCORPORATION OF IT IN TEACHING HAS LONG TERM IMPROVEMENT OF LEARNING OUTCOMES

A prominent example of successful integration of IT in teaching and learning is that of the Apple Classrooms of Tomorrow (ACOT) project. As noted before, educational change takes time and the process is slow (Cuban, 2001; Ertmer et al., 1999). ACOT is a longitudinal study of the use of technology and started in 1985 (ACOT, 2004). Data were gathered systematically over 10 years. These data include personal accounts of teachers’ experiences in ACOT classrooms in schools located in Northern Great Plains, West Coast, Great Lakes, and the South of the United States of America. Sandholtz, Ringstaff, and Dwyer (1997) reported that there were positive changes in student attitude. Their interest and motivation typically extended to the last week of school and as students became involved in working on computers, the time they spent on assignments and projects often increased. Students’ enthusiasm and interest resulted in greater on-task behaviour and they were highly involved in their assignment and frequently able to work with little assistance. The project increased student initiative as they worked beyond the requirements of their assignments, and independently explored new applications and developed new skills. Student experimentation and risk taking increased.

These examples provide evidence that the applications of IT in the classroom do enhance teaching and learning. The advantages of using IT in teaching and learning are explored in the next section.

2.4 ADVANTAGES OF USING IT IN TEACHING AND LEARNING

Much research has been done on using IT in teaching and learning, and many advantages have been cited as consequences (DeSieno, 1995; Kemp, 1995; Poole, 1997; Roblyer et al., 2000; Sandholtz et al., 1997; Smith, 1998). Classifications of benefits of using IT in classroom teaching and learning are as follows:
2.4.1 TO SUPPORT TEACHING

IT can help teachers in their teaching by motivating students, enhancing teaching, increasing productivity, and enabling them to duplicate excellence (Poole, 1997).

2.4.1.1 MOTIVATES STUDENTS

Motivation has always been important in teaching and learning. Webb (2000) believes that “a vision that motivates is the standard constant for success across all social classes and/or lifestyles”. He asserted that motivation is built on three basic elements: 1) Creating freedom fulfilling a need or dream; 2) Love to learn, accept risk and seek opportunity; 3) Learn from failure to overcome barriers. He also set seven rules of motivation: 1) Set a major goal, but follow a path; 2) Finish what you start; 3) Social with others of similar interest; 4) Learn how to learn; 5) Harmonise natural talent with interest that motivates, 6) Increase knowledge of subjects that inspires; and 7) Take risks (p. 1). Davis (1993, 2002) believes “there is no single magical formula for motivating students. Many factors affect a given student's motivation to work and to learn: Interest in subject matter, perception of its usefulness, general desire to achieve, self-confidence and self-esteem, as well as patience and persistence” (p. 1)

With colourful and attractive graphics, interesting and illustrative animations, appropriate sound effects, IT provides multisensory stimulations and real-world experiences (CTGV, 1993; Lave, 1988; Spiro, Coulson, Feltovich & Anderson, 1988). Teachers using IT in teaching can gain the learners’ attention (Boeree, 1998; Roblyer et al., 2000), motivate students to spend more time on learning activities with greater concentration (Dix, 1999; Kemp, 1995), and engage them through production work (Brosseuk, 1998; Roblyer et al., 2000). IT can extend the range of alternative teaching methods beyond the conventional classroom (e.g. self-paced learning, collaborative team or group activities, distance learning, and so on) (Kemp, 1995).

2.4.1.2 ENHANCES TEACHING

The effects of teaching can be enhanced by linking learners to learning tools and information sources and helping learners visualize problems and
solutions (Roblyer et al., 2000). Using IT can provide an anchored, situated, and real-world environment to engage students with flexible and personal choices to accommodate different perspectives (CTGV, 1993; Kemp, 1995; Lave, 1998; Spiro et al., 1988). Using software like Cabri Geometry and simulation enables teacher present different situations to students interactively, which was impossible with chalk and talk (W.K. Leung, (n.d.)).

2.4.1.3 INCREASES PRODUCTIVITY

Using IT can free teachers’ time on administration and record keeping (Kemp, 1995; Poole, 1997; Roblyer et al., 2000) and help teachers tracking learners’ progress (Roblyer et al., 2000). Through access to the Internet, IT can provide more accurate information more quickly (Roblyer et al., 2000). IT allows teachers to produce professional quality, more “student-friendly” teaching materials which can include their own ideas and perspectives more quickly and efficiently (Poole, 1997; Roblyer et al., 2000). By using IT, there is also a saving of time spent on writing on the board which can be used for other activities. The materials developed can be used in future years, and can be further improved after being tried (Poole, 1997). So IT improves the effectiveness and cost-efficiency of teaching (Kemp, 1995) increases the quality of teaching (Barone, 1996), and increases teachers’ satisfaction (Kemp, 1995).

2.4.1.4 ENABLES A TEACHER TO DUPLICATE EXCELLENCE

In order to create an atmosphere and a culture using IT in teaching and learning, it is important that innovative teachers can share their experiences and teaching materials that incorporate the ever-increasing stock of computer-based teaching aids through making them available on the Internet and Intranet (Poole, 1997). Through vicarious experience, persuasion, observation and other staff professional development activities, teachers can enhance their teaching skills and technological levels, as well as their own practice and self-efficacy (Bandura, 1977b; Guskey, 2000; Sparks & Loucks-Horsley, 1990). This was also the rationale of the Information Technology in Education Network (ITEN, (1998), http://itied.net) project and the Hong Kong Education City (HKEdCity, (2001), http://hkcedcity.net). Teachers can share their experiences and materials,
and seek help and clarifications in difficult to teach areas. The high hit rates indicate the usefulness and popularity of these websites among Hong Kong teachers.

2.4.2 TO SUPPORT STUDENT LEARNING

Besides helping teachers, IT can also support students’ learning with better attitudes, deeper understanding, and positive results. IT can also support students’ socialisation and prepare students for a technology-oriented world, as explained in more details below.

2.4.2.1 ATTITUDES

Students using computers or IT to learn are, in general, more enthusiastic (Brosseuk, 1998), and possess higher overall student motivation and interest in learning (Dix, 1999; Green & O’Brien, 2002; Sandholtz et al., 1997). The use of IT enables students to accept more responsibility for their own learning (Kemp, 1995).

2.4.2.2 UNDERSTANDING

Students can develop an understanding of the pervasive impact of IT on the society and their daily lives, higher-order thinking skills, as well as seek, evaluate, organize and present information (EMB, 1998; Jonassen, Peck & Wilson, 1999; Vincent & McCrae, 1999). IT increases the empowerment of students (DeSieno, 1995; Smith, 1998), provides learning experiences that developed higher level thinking skills (Kemp, 1995), and lead to greater retention of what is learned (Kemp, 1995).

2.4.2.3 STUDENT RESULTS

Students have gained impressive and positive results in researcher constructed tests, standardised tests, and national tests (M2 Communications Ltd., 2001; Yelland, 2001). Using IT can expand the learning environment for students beyond the regular classroom with more on-task activities by students (Kemp, 1995). Students can become active learners, engage in self-guided, cooperative, on-demand, on-line, independent and open learning, and develop habits of life-long learning so as to ride on the tides of rapid changes (EMB, 1998; Mühlhäuser, 1995)
2.4.2.4 TO SUPPORT STUDENTS’ SOCIALISATION

Using computers and IT in group projects fosters and facilitates cooperation and collaboration. When Students working together they are able to share experience and exchange views. They are able to develop their inter-personal skills and learn how to handle conflicts and resolve problems together through doing group projects (Lave, 1988; Poole, 1997; Vygotsky, 1978).

2.4.2.5 TO PREPARE STUDENTS FOR A TECHNOLOGY-ORIENTED WORLD

Providing the required technology, information and visual literacy for an information age helps students acquire the required knowledge and skills so that they can work effectively in a technology-oriented world (Kemp, 1995; Roblyer et al., 2000).

2.5 HOW TO INTEGRATE IT IN TEACHING

Although using IT in teaching is advantageous as listed above, improper use of IT would make students’ learning very difficult, if not impossible. For example, in an expository approach, if the teacher presents a huge amount of information to students through a Microsoft PowerPoint® presentation within a short time in class, the time for students to think and assimilate could be reduced through this use of IT (Ki, 2000). In Hong Kong where teaching is schedule-tight, the researcher found from school visits and discussion in experience-sharing seminars that it is popular for teachers to use a Microsoft PowerPoint® presentation to cover the scheduled content in the time frame. It would be advantageous to study how to integrate IT in teaching.


2.5.1 APPLICATIONS OF IT ACCORDING TO LEVEL OF COMPUTER USE

Marcinkiewicz (1993) divided computer use in teaching according to the
degree of involvement into three levels: no use, familiarisation and use, and integration, with a general focus on the use of computers in education as a whole, as shown with examples in Table 2.1. Evans-Andris (1996) considered two aspects and dichotomised orientations to computing into distancing and embracing, and trichotomised computing styles into avoidance, integration, and technical specialisation, compressing Marcinkiewicz (1993) last two levels into one and adding another level to signify teachers’ advancement into the technology.

Table 2.1
Marcinkiewicz’s three levels of computer use (1993).

<table>
<thead>
<tr>
<th>Level</th>
<th>Description (Activities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Use</td>
<td>Teaching without using computers at all</td>
</tr>
<tr>
<td>Familiarisation and Use</td>
<td>WP for notes and test paper preparations. Teachers are not using computers in teaching. Teachers may start using the computer themselves with courseware until they feel confident. They may then let students use</td>
</tr>
<tr>
<td>Integration</td>
<td>There will be more student-centred learning. Teachers may develop their own teaching materials.</td>
</tr>
</tbody>
</table>

Moersch (1995) focused on the process of integrating computers and IT, and divided technology implementation into seven levels, as shown in Table 2.2.

Table 2.2
Moersch’s seven levels (1995) of technology implementation.

<table>
<thead>
<tr>
<th>Level</th>
<th>Description (Technology Implementation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No use: Text-based (sheets, chalkboard, OHP)</td>
</tr>
<tr>
<td>1</td>
<td>Awareness: Computer-based applications have little or no relevance to teacher’s instructional program</td>
</tr>
<tr>
<td>2</td>
<td>Exploration: Supplement to existing instructional program – extension or enrichment</td>
</tr>
<tr>
<td>3</td>
<td>Infusion: Content free augment isolated instructional events</td>
</tr>
<tr>
<td>4</td>
<td>Integration: Rich context for understanding of pertinent concepts, themes, processes</td>
</tr>
<tr>
<td>5</td>
<td>Expansion: Extended beyond classroom; expand students’ experience</td>
</tr>
<tr>
<td>6</td>
<td>Refinement: Seamless medium for information queries, problem solving &amp; product development</td>
</tr>
</tbody>
</table>
2.5.2 APPLICATIONS OF IT ACCORDING TO SOFTWARE

Sheingold and Hadley (1990) focused on the software used and reported eight different practices of using computers in the classroom, with focus on software used, as shown in Table 2.3.

Table 2.3
Computer-based practices focused on software used.

<table>
<thead>
<tr>
<th>Practices</th>
<th>Description (Software Used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Text-processing</td>
<td>Word-processor, keyboarding, spell checker, outliner</td>
</tr>
<tr>
<td>2 Instructional SW</td>
<td>Problem solving, tutorial, drill &amp; practice</td>
</tr>
<tr>
<td>3 Analysis &amp; Information</td>
<td>DB, SP, chart/graphing, calculator, lab interface, statistics</td>
</tr>
<tr>
<td>4 Programming &amp; OS</td>
<td>OS, Basic, LOGO, Pascal, Authoring, HyperTalk</td>
</tr>
<tr>
<td>5 Game &amp; Simulation</td>
<td>Microworld, simulations, instructional games</td>
</tr>
<tr>
<td>6 Graphics &amp; Operation</td>
<td>Clipart, paint/draw, DTP, drafting, CAD, music composition</td>
</tr>
<tr>
<td>7 Communication</td>
<td>BBS, OLDB, OLS, email, Internet, school-school &amp; school-home communication</td>
</tr>
<tr>
<td>8 Multimedia</td>
<td>Videodisc, robotics</td>
</tr>
</tbody>
</table>

After observing classroom teaching in a number of primary and secondary schools, Law, Yuen, Ki, Li, Lee, and Chow (2000) grouped students’ learning activities in Hong Kong primary schools into nine types as shown in Table 2.4, which were similar to the eight practices of Sheingold and Hadley (1990).

Table 2.4
Reported usage of different kinds of technology in different activities.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Computer-related Technology Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 2 Information Processing</td>
<td>Information Retrieval</td>
</tr>
<tr>
<td></td>
<td>Spreadsheet</td>
</tr>
<tr>
<td></td>
<td>Word processing</td>
</tr>
<tr>
<td>3 – 5 Production</td>
<td>Presentation</td>
</tr>
<tr>
<td></td>
<td>Drawing &amp; Graphics</td>
</tr>
<tr>
<td>6 – 7 System Software &amp; Language</td>
<td>Operating system</td>
</tr>
<tr>
<td></td>
<td>Programming Language</td>
</tr>
<tr>
<td>8 Drill &amp; Practice</td>
<td>Drill &amp; Practice Programs</td>
</tr>
<tr>
<td>9 Others</td>
<td></td>
</tr>
</tbody>
</table>

2.5.3 APPLICATIONS OF IT ACCORDING TO USAGE

Taylor (1980) analysed the applications of computers in education from the perspective of how computers were used and summarised them into the three T’s, namely, Tutor, Tool, and Tutee, which covered three major
categories of uses in the classroom. Clements, Nastasi, and Swaminathan (1993) suggested a choice of three paths to follow in terms of the teaching approaches of using IT in education: Drill and Practice which was behaviouristic where students engaged in skill training and rote learning with reinforcements, Structured Software in the Curriculum which accommodated computer software into existing curricula, and as an Artefact of Innovation which was in the constructivist approach. Emphasis was placed on the third path which was “characterised by the use of problem-solving software and generic applications that can encourage problem solving in new and dynamic ways, and afford opportunities to present material in sophisticated ways” (p. 27). Kemp (1995) also cited five ways with examples of how IT is used: (1) for Presenting Information, (2) for Tutorial Learning, (3) for Exploratory Learning, (4) as Productive Learning Tools, and (5) for Instructional Communications among Individuals and Groups.

2.5.4 APPLICATIONS OF IT ACCORDING TO PEDAGOGY AND PRACTICE

Veen (1995) focused on classroom practice and reported observations of seven categories of computer-assisted lessons as shown in Table 2.5.

Table 2.5
Veen’s seven categories (1995) of computer assisted lessons.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Description (Classroom Applications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Electronic Blackboard</td>
<td>Use a CAL software as a page turning machine to display text, graphics and/or sound</td>
</tr>
<tr>
<td>2) Working apart together</td>
<td>Using CAL software for remedial purposes. Students with poor scores work two by two on the computer. Rest work in a whole group classroom setting</td>
</tr>
<tr>
<td>3) Rotating Group</td>
<td>Students form groups to engage in several activities on rotation where computer is one setting.</td>
</tr>
<tr>
<td>4) All students use media, including computers</td>
<td>Teachers are using simulations, display of graphics, maps, etc., as well as other media to help students to learn. Media is actually used by the teacher.</td>
</tr>
<tr>
<td>5) Voluntary extra work with computers</td>
<td>Extra work for high ability students.</td>
</tr>
<tr>
<td>6) Computer lab. No tech. Support</td>
<td>Use of computer room to teach word processing, geography simulations, drill &amp; practice.</td>
</tr>
<tr>
<td>7) Computer lab. With support</td>
<td>Teacher serves as technical assistant. Subject teacher is supported by the technical assistant.</td>
</tr>
</tbody>
</table>
The “Learning with Software” website (1996) was concerned with the use of software in learning, but it focused more on pedagogical strategies of incorporating IT in teaching: (1) Rotational use of computers, (2) Needs-only basis, (3) Computer as reward, (4) Computer use on contract, (5) Computer as electronic blackboard, (6) Integrating the computer, (7) Computer as surrogate teacher, (8) Computer as cognitive tool.

From the references cited above, we can see how researchers divided the ways of using computers or IT in teaching and learning. The division was started from a simple trichotomy of the degrees of integration which was more general and a bit crude. The division according to the software used was a more complicated one which included more detailed observations. The division according to pedagogies and practices in the classrooms was better for incorporating IT in teaching.

2.6 SUMMARY OF OUTCOMES OF RESEARCH ON INTEGRATION OF IT IN TEACHING AND LEARNING

The outcomes of research on integration of IT in teaching and learning are summarised here to inform the current study.

- Training and support: Teachers felt ill-prepared or inadequately supported to integrate IT into the curriculum (Jewell & Manning, (n.d.))
- Teachers’ confidence: Teachers are uncomfortable integrating IT into the curriculum (Blocher, Montes, Tucker, & Willis, 2000)
- Teachers’ frequency of using computers: Cuban (2001) found that fifteen years ago, “the majority of U.S. teachers were nonusers of computers in their classrooms, about 1 in 4 was an occasional user (at least once a month), and 1 in 10 was a serious user (at least one or more times a week) (p. 71). With the recent vast acquisition of hardware and software, and the campaigning to convince teachers to use the new technologies in their classrooms, there are still “over half of elementary and middle school teachers continue to be nonusers of computers for classroom instructions, about 1 in 3 are occasional users, and about 1 in 10 uses the technology daily” (p. 72).
Factors affecting the use of computers: Cuban (2001) found that “neither the age, experience, nor gender of teachers was a significant factor … little difference in computer use between veteran and novice teachers, between those with and without previous technological experience, or between men and women … We did not find technophobia to be a roadblock. Teachers … called for more and better technology, were avid home users, and believed in the future ubiquity of computers in society” (p. 98).

Uses of computers in the classrooms: After classroom observations and interviews with principals, teachers and students, Law et al. (2000) grouped IT usage in classrooms in Hong Kong primary and secondary schools into five approaches, namely, expository teaching, inductive teaching and learning, task-based learning, problem-based learning, and social-constructivist. Ki (2000) and Kong and Pun (2000) found that usage of IT in primary schools fell into the first three approaches only. Cuban (2001) noted a usage which is also common in classroom practice.

- Expository Teaching: Teachers used the multimedia teaching materials developed by themselves, other teachers or students of HKIEd using the Microsoft PowerPoint® or Macromedia Authorware (Amos, 1998; Kong & Pun, 2000) to stimulate students to think and respond (Kong, Au & Pun, 2000) and to facilitate their “mastery of standardised facts, concepts, rules and procedures” (Ki, 2000, p. 55).

- Inductive Teaching and Learning: Teachers used CAL quiz, exploration or simulation packages and games to engage students in “deep learning through critical thinking, problem-solving, exploration and discovery” (Cuban, 2001; Ki, 2000; Kong & Pun, 2000).

- Task-based Learning: Task generally involves the learners in an active process of understanding of the purpose and the situation and to explore different ways to accomplish it with a more open-ended outcome, getting information from on-line and off-line resources allowed some room for learners to add their own personal flavours and stronger sense of ownership of the product (Cuban, 2001; Ki, 2000; Kong & Pun, 2000).
Drill-and-practice: Cuban (2001) found that 18% of the teachers in his study used drill-and-practice software. This is common in remedial and other classrooms (Amos, 1998; Yelland, 2001).

Changes in teaching paradigm: Cuban (2001) found that teachers who used computers in their classrooms largely continued their customary practice, “few fundamental changes in the dominant mode of teacher-centred instruction have occurred … occasional to serious use of computers in their classes had marginal or no impact on routine teaching practices. In other words, most teachers had adapted an innovation to fit their customary practices, not to revolutionise them” (pp. 96-97). Cuban (2001) noted again that “the overwhelming majority of teachers employed the technology to sustain existing patterns of teaching rather than to innovate” (p. 134). Cuban’s (2001) observations agreed with those of Ertmer et al. (1999) and Sandholtz et al. (1997).

Changes in teachers’ practices: In interviews with 21 teachers, Cuban (2001) found that 13 said that their teaching had indeed changed because of their use of information technologies. Changes include “planning more efficiently, communicating with colleagues and parents far more via the Internet, securing education materials from the Internet, having an additional tool in their customary set of teaching practice, and seeing students’ access to information as a phenomenal enhancement to their teaching (p. 94). Of the 13 teachers who said that their teaching had changed, only four said that they had modified their daily practices in major ways: “organised their class differently, lectured less, relied more on securing information from sources other than the textbook, gave students more independence, and acted more like a coach than a performer on stage” (p. 95)

Different phases of instruction revolution in IT-rich classroom: There are five phases in the instruction revolution in IT-rich classrooms, namely, Entry, Adoption, Adaptation, Appropriation, and Invention. It took Sandholtz et al. (1997) over ten years to identify the phases.

Incremental Changes: “Champions of technology wanted fundamental change in classroom practice”, but the teachers “interviewed and observed, however, engaged mostly in incremental changes” (Cuban, 2001, p. 135)
2.7 CONTEXT OF EDUCATION IN HONG KONG

This section serves to provide some context for education in Hong Kong to which the professional development initiative was implemented. It consists of the culture, infrastructure, education reform, and teachers’ working conditions. The difficulty of entering Chinese characters into the computers is also discussed.

After the return of sovereignty of Hong Kong from Britain to China, the Hong Kong government wanted to control the financial deficit and combined government departments. Formerly, the Education Department was under the Education and Manpower Bureau, but the two organisations were two different entities. They merged in 2003 to form one government department, namely, the Education and Manpower Bureau (G. Cheung, 2002; Kong, 2003; A. Leung, 2002). In the discussions below, references of the Education Department refer to what this is.

2.7.1 CULTURE OF EDUCATION IN HONG KONG

Research reported that a number of accepted principles of Western educational psychology did not transfer easily to the Chinese learner, causing misconceptions about the Chinese learners and teaching (Watkins & Biggs, 2001). This section tries to examine the culture of education in Hong Kong.

2.7.1.1 EXAMINATION-ORIENTED, NORM-REFERENCED, PERFORMANCE-ORIENTED

The purpose of learning in Confucian’s Great Learning is “to investigate things to extend knowledge” (格物致知) and “to manifest one’s bright virtue” (大學之道在明明德). Through sincere will, correct mind, cultivated self, harmonised clan, the final aims are a well governed state or country and peace.
throughout the land (意誠、心正、身修、家齊、國治、天下平) (F. Leung, 1999; Muller, 1990). The Chinese saying that “Learned with excellence will become an officer (學而優則士)” depicts the objective of thousand years of Chinese education. Education, examination, being a government officer, and high income and power, are all tied together. Study in China in the past, was directed at achieving excellent results in the imperial examination so a high rank position in the government would be possible. Similarly, the aim of education in Hong Kong was to produce officials to serve in the colonial government (Chung & Ngan, 2002).

Influenced by the Chinese Imperial Examinations and the British elitist education system, examination became the only formal assessment in Hong Kong. Students’ school lives consist of a series of examination processes (Ng, 1984). Students study to achieve good marks in the examination. Thus the Hong Kong education system is examination-oriented, performance-oriented (Chung & Ngan, 2002; Ho, 1999; Lo, 2000).

Students of all schools in Hong Kong, except those of the international schools, have to take the same set of examination papers, no matter whether their standards are high or low. Though there are model answers and marking schemes, the results are modulated. So the examination is norm-referenced (Watkins & Biggs, 2001).

2.7.1.2 SUBJECT-BASED

Cuban (1986) found that secondary schools in the United States of America are examination-oriented, thus they are subject-based to meet the external demands for performance. The primary education system in Hong Kong is examination-oriented and norm-referenced (Section 2.5.1.1). It is also subject-based. Each subject is taught by an expert subject teacher. Recently, the Chief Executive, Mr. Tung Chee Wah pledged to raise the primary school levels by specialist plan so that language and mathematics teachers focus exclusively on their subjects (Heron, Kwong, & Leung, 2004).
2.7.1.3 HIGHLY SEGREGATED

The Hong Kong education system is a highly segregated one (Lo, 2000). There was a secondary school entrance examination each year during the 50s to the 80s. Before the 70s, there were very few places in secondary schools, only some of the primary school students with good results could attend the examination, and only a small fraction of these candidates could get into secondary schools. Later, more schools were built. All primary school students had to take part in the examination system. Students were divided into five bands according to their examination results (Lo, 2000; Walker & Dimmock, 1999). Secondary school entrance examinations were replaced by the allocation of secondary school places in schools of the neighbourhood network according to their results in the internal examinations in 1978 (Ho, 1999). However, Primary Five and Six students had to take public examinations to determine the rating of their schools, and their internal results were moderated accordingly (Walker & Dimmock, 1999). In school year 2001/02, the Five-Band system was reduced to a Three-Band system. The Board of Education Sub-committee on Catering for Students’ Diverse Needs recommended more funding to those schools affected by the restructuring of bands, and thus included of lower ability students (EMB, 2002). The Hong Kong education system remains a segregated one and “there are no concerted efforts to use measures of positive discrimination to rectify the situation” (Lo, 2000, p. 244). The Education and Manpower Bureau allocates Primary Six students into their choices of secondary schools according to the banding. Schools are classified informally into band-one, band-two, and band-three schools, depending on the banding of the intakes. In order to teach more effectively, schools stream students into classes according to their achievements in the school examinations. Students of different streams have different academic abilities. Students in Hong Kong are thus highly segregated (Ho, 1999; Lo, 2000).

2.7.1.4 TEXTBOOK-BASED AND SCHEDULE-TIGHT TEACHING

Because Hong Kong has a norm-referenced, examination-oriented, highly segregated, and performance-oriented school system, schools and teachers have to prepare students for examinations. To ensure all students at different schools, and students of different classes of the same school are taught the same content,
syllabi of subjects are prepared by the Curriculum Development Institute, a branch of the Education and Manpower Bureau. Textbooks are written mainly by teachers teaching the subjects. Hong Kong textbooks are usually directive and prescriptive, with plenty of teaching advice, assistance and teaching materials. This phenomenon of preparing textbooks to ensure teacher-proof conveyance of the required content was identified by Sierpinska (1999) and described as the Dienes effect. These textbooks are inspected and approved by the Education and Manpower Bureau. Any teacher who follows the guidelines of the textbook will ensure that students are exposed to the same required content. School principals, subject panel chairs or the whole panel may make the decision to adopt a certain textbook, or series of textbooks published by particular publishers. Subject panels are required to set teaching schedules for teachers to follow. Teachers have to stick to the schedules so that all students are taught the same topics before the examination. Thus teaching in Hong Kong is textbook-based and schedule-tight (Lo, 2000).

2.7.1.5 TEACHER-DEFICIT MODEL

The teacher-deficit model mentioned in Section 1.5.2 suggests that, if a student does not achieve good results, it is the fault of the teacher. This model has a deep-rooted tradition in China. A formerly used popular primary textbook for children called the Trimetric Classic said: “To feed without teaching, is the father's fault. To teach without severity, is the teacher's laziness. (養不教、父之過、教不嚴、師之惰)” (Giles, 1910). The teacher-deficit model and the Language Proficiency Assessments have created a lot of pressure on teachers (South China Morning Post, 2004a, 2004b).

2.7.1.6 PARENTS’ EXPECTATIONS

In an examination-oriented and performance-oriented education system like that in Hong Kong, success in the hierarchy is gained through achieving high marks in the examinations. Parents send their children to kindergarten, primary and secondary schools that have a reputation for frequent and difficult examinations, with the hope that their children can go on with secondary and post secondary education. As the Chinese education philosophy is based on the
teacher deficit model, parents expect teachers to be severe and to push the students hard in their study. If a teacher uses methods that are seen as not “teaching” formally, parents think the teacher is not doing a good job. They expect that teachers will give homework to their children every day. If a teacher does not give enough homework, they consider the teacher as indolent. Watkins and Biggs (2001):

Some parents of her school checked their children's homework to ensure that all chapters in the textbook had been covered, and all work items in the text had been set. If they were not satisfied, they immediately filed a complaint to the District Education Office, which took their side and put pressure on the headmaster to bring the teachers into line. In the fiercely competitive game of norm-referenced testing, in preparing for secondary selection, parents are determined that no other child might get an edge on their own child. (p. 15)

Teachers are under pressure from parents and authorities to follow the schedules closely.

2.7.1.7 CHILD REARING PRACTICE

The Chinese believe that praise undermines character, so it is traditional that parents do not praise their child (Salili, 2001). It is a customary practice of modesty that if an outsider praises the child, the parents point out his faults and shortcomings (Wong, 1992). Teachers who are affected by this traditional belief seldom praise their students.

Punishment, however, is considered beneficial to the child and is administered frequently (Ho, 1986). Though corporal punishment is illegal in Hong Kong, parents and teachers may still believe this is the best way to educate the child (Wong, 1992) due to the deep-rooted belief that “cane breeds filiality” (Salili, 2001).

Chinese people have to learn a set of rules from their parents and teachers early in life and have to observe these rules. One rule is modesty. Besides the Confucian teaching that people should be respectful, careful, modest and obedient (Jan, 1980), the teaching of Lao-Tzu says that the wise man knows everything but does not show off his knowledge. This has a deep influence on Chinese behaviour (Huang, 2002). The Chinese are taught to respect their superiors under all circumstances (Salili, 2001). Since in traditional Chinese society teachers are more knowledgeable than parents, they are respected as

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authority and are superior. “Students are taught to respect, obey, listen, and follow their instruction, and not to challenge them” (Salili, 2001, p. 79). “Questioning a teacher could be perceived as a sign of disrespect” (Salili, 2001, p. 79). It is common in Hong Kong classrooms, especially in the primary classroom, that teachers enforce strict discipline on students. Students are not allowed to talk in the classroom. Even when answering a question posed by the teacher, students are allowed to talk only after the teacher gives them permission (Salili, 2001).

2.7.1.8 IMPLICATION FOR TEACHING

In the subject-based, examination-oriented, norm-referenced, study-for-marks education culture, that has directive and prescriptive textbooks and tight teaching schedules, it is clear why teachers usually prefer “chalk and talk” methods in a teacher-centred teaching paradigm. Everything is under their own control, and will proceed according to schedule. Teachers adopt the didactic approach and spend their time in helping their students to memorise the content of their subjects for tests and examinations so that their students can get good results in examinations and tests (Chung & Ngan, 2002).

In view of the implementation of innovative teaching methodology like integrating IT in teaching, Lo (2000) gave a description which could reflect teachers thinking:

To discard tried methods which emphasise the acquisition of factual knowledge for untested methods which favour exploration of ideas is to jeopardise the success of students in examination. Since examination results are still the only criterion for promotion to the next level of schooling, teachers usually treat them with great care, the dominance of examination in curriculum implementation and teaching seems inevitable … teachers seem reluctant to adjust their pedagogical methods in the classroom. (p. 246)

Since examinations are undertaken with total supervision on the same paper and with exactly the same amount of time, schools and teachers think the examination results are fair. But projects are done by groups or individual students after school or at home, and in the class. While working on projects students can talk to one another. Thus schools and teachers tend to think that project results are less reliable than examination results. No matter how well a student might do with a project, if he or she fails in the examination, it will be
suspected that the student did not do the project alone (Lo, 2000).

Because of the education culture and the requirement to follow the schedule to cover the syllabus for students to sit the examinations, teachers tend to use teacher-centred didactic approach to ensure the teaching is on task. To ensure students learn, however, very often, they use a ‘deep’ approach in the form of repetition, which help students develop skills and knowledge (Biggs, 1996). The argument is presented in the next section.

2.7.2 WESTERN MISCONCEPTIONS OF CHINESE LEARNING CULTURE

As Hong Kong education is subject-based, examination-oriented, norm-referenced, performance-oriented, and teaching is textbook-based and schedule-tight, with large classes, poor equipment, expository teaching methods, is sharply focused on preparation for external examinations, the classroom teaching appears to be authoritarian to Western observers (Biggs, 1996). Beliefs about learning-related activities are different in Western and Asian cultures. The order in the Western culture is exploration first, then the development of skills, while the order in the Chinese culture is the opposite, skill development first, then something to be creative with (Biggs, 1996). In the skill development process, the teaching seems to be repetitive using rote learning. Biggs (1996) found that teachers pose provocative questions, allow reflection time, and use “various techniques to suit individual students, using the Confucian ‘elicitation’ mode in full swing” (p. 55). Biggs (1996) also found repetition is not rote learning but a route to understanding. He cited the learning of Chinese characters as an example. Children learn Chinese characters using their five organs, namely, eyes to see the shape, ears to hear the sound, mouth to speak the sound, hand to write the character, and mind to remember its meaning. Then they learn to “form each character into word, and each word into sentence. Repetition certainly, rigid maybe, but embedded in meaning always (at least that is the intention), with much use of learner activity and involvement, a key ingredient in quality learning” (p. 57). Chinese teachers believe there is only one ‘right way’, students must tread that path, but it is by ‘holding the hand’, not by ‘putting in the boot’, which is generally the method preferred by authoritarian Westerners in the classroom” (Biggs, 1996, p. 56).
2.7.3 SPATIAL PROBLEMS IN HONG KONG

As the study was performed in Hong Kong, a brief introduction to Hong Kong primary schools may be useful for readers. As mentioned in Section 2.5, Education Department was under the Education and Manpower Bureau but were two separate organisations before the merger in the 2003-03 school year. All schools in Hong Kong were controlled by the Education Department before 2003 and the EMB after 2003. Depending on the running bodies, there are five types of primary schools in Hong Kong, namely, government, aided, private, international and direct subsided (Sweeting, 1995). Government schools are run by the Education and Manpower Bureau. They have the best resources and teachers, and a lot of rules and regulations for schools and teachers. Aided schools are run by churches, charitable bodies, tribal communities or other organizations such as sponsoring bodies. They also have good resources and teachers, but are strictly controlled by the Education Department (now EMB) by the “code of aid” (Education Department, 1994; Walker & Dimmock, 1999). Private schools are run by people who regard education as a business and seek to make a profit. International schools are run by “sponsoring bodies” and cater mainly for children of expatriates from different countries such as Australia, U.K., Canada, Japan, Korea, Germany and Switzerland, Singapore and U.S.A. (Bray & Yamato, 2003). Students do not join the secondary allocation scheme and are usually promoted to the secondary schools run by the same sponsoring body. The Direct Subsidy Scheme (DSS) was proposed in Education Commission Report No. 3 (Education Commission, 1988; EMB, 2003a, 2003b) but only eleven schools received approval from the Education and Manpower Bureau in 2003-04 school year (EMB, 2003a). They are the privileged few of aided schools which are allocated a lump sum of funding each year and can then operate like a private school with full independence from the government.

The size, location, and spatial relationship are important factors affecting students’ learning (Chan, 1996). The sizes of schools and the classrooms are also affecting the implementation of IT in teaching and learning, so a brief introduction about primary school buildings is given here to familiarise the readers. Primary school buildings in Hong Kong followed more or less the same building plan in the same periods of time when they were built. They can
be classified into five types, namely, the rooftop schools in 1950, matchbox estate schools in mid-60s, stand-alone estate schools in the mid-70s, flex-type schools in the 80s and 90s, and the millennium schools in 2000 (Chung & Ngan, 2002).

The roof-top schools were make-shift schools on the top of seven-storey buildings catering for refugees whose squats were destroyed by fire. Roof-top schools were all closed when the seven-storey resettlement estates were demolished in the past two decades.

Matchbox estate primary schools reconfirmed the previous practice that building primary schools was a by-product of massive low-cost public housing development. Instead of converting the rooftops into schools, the primary schools and the low-cost housing were built simultaneously. Instead of an ad hoc measure, the primary schools were systematically built. These schools were built to meet the minimum educational needs of the day, not the holistic needs of the children in the future (Chung & Ngan, 2002). Chung and Ngan (2002) gave a vivid description of these schools.

“The matchbox estate primary schools were built along with the massive public low-cost housing construction. The twenty-four-classroom school was a six-story single block attached to the nearby public housing development. On each floor, there was a central corridor and three classrooms on each side. Designed without any acoustic consideration, pupils could easily hear what were going on in adjacent classrooms. The central hallway was gloomy and narrow. Better than the barren rooftop schools, four extra rooms were provided for music, art and craft, library, and medical care. Similar to the previous rooftop stage, quantity, not quality was the top consideration. Thus, these schools were barely equipped, much like the early Ford model-T — a vehicle that can provide basic transportation but nothing more. The whole school was not decorated. Most classrooms were equipped with chalk and board only. Lighting was sufficient but aesthetics was not a consideration. The classrooms were poorly ventilated for the hot summer days typical of Hong Kong” (p. 27).

The staff room was so congested that there was not enough space for communication between teachers and students. Extracurricular activities were difficult to organise due to the bi-sessional operation of school premises. Teaching resources for subjects were scant or non-existent. The schools were designed for “the exam-oriented, elite approach in primary education leaving the social, emotional, aesthetical, physical, vocational needs of the pupils neglected from these matchbox type estate schools” (Chung and Ngan, 2002, p.
28). As there were 24 classrooms for four classes of each of the six years, plus four special rooms in schools of matchbox type of buildings, there was no extra room for the computer room, server room or multimedia language centre. Schools had to convert part of the art and craft room or the music room, the medical room, or even toilets to make room for the computer room.

Stand-alone estate schools were essentially match-box single block multistorey schools also built as a by-product of massive low-cost public housing development but stand-alone rather than attached to the estate. There were also 24 classrooms initially, but were converted to 30 classrooms by converting the playground on the ground floor into classrooms. Instead of a central corridor, there were six classrooms in a row on each floor. There was an assembly hall on the second floor, a conference room and a storage room for each school. Some schools converted the storage room or other rooms for the computer room and sever room.

The flex-type schools in the 80s and 90s were built in blocks in the shapes of a “U” or an “L”. In addition to the 30 classrooms, there were four special rooms, three preparation rooms, and three remedial teaching rooms. The conversion of computer rooms was easier than it was in the former types of school buildings.

Millennium schools have bigger and better equipped classrooms. They also have more special rooms such as a computer learning room, computer preparation room, language laboratory, conference room, multi-functional room, and discipline master offices (Chung & Ngan, 2002). They are designed for the incorporation of IT in teaching and learning.

For matchbox and stand-alone estate schools, or even some flexi-type schools, the ‘layout, facilities, and equipment of the school did not facilitate teaching strategies other than “chalk and talk”. Project work, group discussions, experiments, or role-play was difficult to arrange in such classrooms’ (Chung & Ngan, 2002, p. 28).

2.7.4 EDUCATION REFORMS

When a new discourse or technology in education appears, there is a need to reform in order to keep abreast with the world. The following gives a brief
description of the education reforms in the past three decades and their effects on teachers.

2.7.4.1 FREQUENT EDUCATION REFORMS

The Education Department initiated many education reforms to keep abreast with various trends in other education systems around the world (Curriculum Development Council, 2000, 2001, 2003; Education Commission, 1984, 1986, 1988, 1990, 1992, 1996a, 1996b, 1999, 2002, 2003a, 2003b; Education Department, 1965, 1981a, 1981b, 1991, 1992, 1994, 2002). In the early 70s, a reform from traditional Geometry, Trigonometry, Algebra and Arithmetic to the Modern Mathematics in secondary schools was promoted. In 1981, The Education Department promoted the Activity Approach, giving extra resources and lower student to staff ratios to schools adopting this approach. In 1992, the Targets and Target-Related Assessment (TTRA) was enforced (Education Department, 1992) which caused a considerable number of complaints. A modified version called the Target Oriented Curriculum (TOC) was introduced in 1995. In 1996, the world was talking about quality assurance; hence the Quality Assurance Inspection (QAI) was then implemented (Education Commission, 1996b). In 1997, as mentioned in Section 1.4.4, the Chief Executive of the Hong Kong Special Administrative Region wanted Hong Kong to be a leader, not a follower in Information Technology, so the Information Technology in Education innovation was initiated with a five-year strategic plan with a lot of resources being poured into the reform (EMB, 1998). Many seminars and workshops were organised by the Education Department (1999a, 1999b, 1999c, 199d, 1999e, 1999f). After the return of sovereignty from the British to China in 1997, it was believed that the Medium of Instruction (MOI) should be in Chinese instead of English, so the policy of Chinese as MOI was enforced (Education Department, 1998b, 2001) which caused a lot of complaints and grievances (Goldstein, 1997; Kwok & Sui, 1998; Lee, 1997). Recently, the Education Department has promoted another education reform called “Learning to Learn” (Education Commission, 2002, 2003b). It was hoped that students could develop an ability to learn independently, and so become a life-long learner. Usually an officer in the Education Department is responsible for the reform. The reform was taken from
western practice (Walker & Dimmock, 1999) and might not have taken into consideration sufficiently the limitations faced by the schools, teachers, and society (Ngan and Lee, 2002). The implementation was top-down (Lo, 2000). Morris (1992) found that these education reforms have many features which have been associated with unsuccessful implementation:

A highly centralised strategy of curriculum policy-making; a laissez faire approach to implementation; very limited participation in decision-making; and a tendency to mandate changes and to rely on official documents and conferences as their main resources and linkage to support a change (pp. 36-37).

Sometimes the reform contradicted other reforms already enforced (Lo, 2000). For example, teachers are caught in the dilemma of using a student-centred approach which it was believed helped students learn effectively and the teacher-centred approach which could ensure good student examination results (Hargreaves & Lo, 2000; Walker & Dimmock, 1999).

2.7.4.2 EFFECTS ON TEACHERS

The Democratic Alliance for Betterment of Hong Kong, a political party, interviewed one thousand primary and secondary school teachers in September, 2002. They found that 70% of teachers reported that they were under enormous pressure which had negative effects on the quality of their teaching. Eighty percent believed the pressure came from frequently changing education reform (Singtao Education News, 2002). From the two large scale surveys by the Hong Kong Professional Teachers’ Union, the rapidly changing education policy had become the number one source of great pressure on teachers (See Section 2.6.4.2 for more details) (HKPTU, 2001, 2003; Metro News, 2003; Singtao Education News, 2003b). Every time there was an education reform, there would be a lot of seminars and workshops for teachers to attend (Education Department, 1999a, 1999b, 1999c, 1999d, 1999e, 1999f). When teachers had just finished attending one series of seminars and works, another education reform was introduced, with another series of seminars and workshops.

Morris (1992) analysed the curriculum development in Hong Kong and found that there should be a distinction “between teachers’ expressed attitudes towards the general rhetoric of teaching and their expressed attitudes toward the reality of teaching” (p. 44). He found that:
The official introduction of curriculum which is inappropriate for local circumstances is arguably typical of the paternalism which imbues most aspects of Hong Kong society. Teachers do not react negatively to these innovations. They are willing to accept and support the rhetoric of the innovation but no attempt is made to translate this into classroom practice (p. 45).

Teachers became weary at these “Tiger head, snake tail” types of reforms. They would implement some superficial, cosmetic work to pacify the authorities, in a manner characterised by the officers in Mainland China – “When there are policies from above, there are strategies below”. They knew the reform would soon be over when the officer was promoted to a higher rank. Then they had to prepare for the next education reform.

2.7.5 TEACHERS’ WORKING CONDITIONS

Watkins and Biggs (2001) found that Hong Kong students are “taught in classroom conditions that in terms of western standards cannot be conducive to good learning: large classes, expository methods, relentless norm-referenced assessment, and harsh classroom climate” (p. 3).

The working conditions can encourage or discourage teachers from working hard for their students. The following will examine the space a teacher enjoys in the staff room, and the workload of an average teacher. It will also look at the ways the resources are organised for teachers to use.

2.7.5.1 TEACHERS’ SPACE

The standard areas for each staff member in a staff room in Hong Kong range from 1.2 sq. m in stand-alone primary schools, to 1.6 sq. m in flex-type primary schools, and around 2 sq. m. in Millennium Schools (EMB, 2002). Each teacher is provided with a desk that is 90 cm by 60 cm to 106 cm by 90 cm, depending on the space available in the staff room and the number of teachers in the school. Many schools provide the teachers with a wooden shelf placed on top of the teachers’ desk to stack up students’ assignments, ready to be marked and returned to the students. There is not much space for teachers to do preparation, or to use a notebook computer at their desk. Space is always a major constraint for teachers (Chung & Ngan, 2002, p. 28).
2.7.5.2 TEACHERS’ WORKLOAD

From the results of a survey on pressure on Hong Kong primary and secondary teachers by the Hong Kong Professional Teachers’ Union in 2001, it was found that, out of 2779 questionnaires returned from 715 schools, 27.1% worked more than 12 hours per day. There were 62.6% teachers worked over 11 hours, and 94.7% worked over 9 hours. There were only 5% teachers worked 8 hours or less per day (Table 2.6).

The percentages of day per week on work inside and outside school related to teaching, administration, preparation, development, report and meeting documents also indicated teachers’ high workload. Over 44% of teachers worked six days a week. There were 10.9% teachers working seven days and 30.52% working more than 6.5 days. Nearly three-quarters of teachers worked more than six days (Table 2.7).

The percentage of teachers reported that school business, subject, activities and meetings, administration, reports and documents as the most time consuming and low effectiveness work was 63.9%, work to deal with the request from the Education Department on inspections such as Quality Assurance Inspection, conference, activities and documentation was 40.7%, non-teaching work to deal with the society, bodies, school and students was 40.3%.

Table 2.6
Number of hours worked per day by teachers in Hong Kong (2001).

<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>Percentage</th>
<th>No. of days/week</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than seven hours</td>
<td>0.4%</td>
<td>5 days</td>
<td>5.5%</td>
</tr>
<tr>
<td>7-8 hours</td>
<td>4.6%</td>
<td>5.5 days</td>
<td>19.5%</td>
</tr>
<tr>
<td>9-10 hours</td>
<td>32.1%</td>
<td>6 days</td>
<td>44.4%</td>
</tr>
<tr>
<td>11-12 hours</td>
<td>35.5%</td>
<td>6.5 days</td>
<td>19.6%</td>
</tr>
<tr>
<td>Over 12 hours</td>
<td>27.1%</td>
<td>7 days</td>
<td>10.9%</td>
</tr>
</tbody>
</table>

Table 2.7
Number of days per week worked by teachers in Hong Kong (2001).

There were 85.6% of teachers who believed the pressure came from the rapidly changing education reform, 80.6% from the onerous non-teaching work, 60.3% from the avalanche and tsunami of teaching duties, and 51.4% from the ever-falling student abilities. These teachers were very devoted teachers because 25.3% of them liked to be in the teaching profession very much; 61.0%
liked the profession; and only 1.9% did not like the profession; and 0.4% did not like the profession very much.

There were 10.8% of teachers who felt unbearable pressure; 62.7% believed that they needed to decrease the pressure (HKPTU, 2001).

The 2003 survey revealed the workload had increased. There were 34% teachers working more than 12 hours per day, and another 34% worked 11-12 hours. The total number of teachers working more than 11 hours had increased from 62.6% in 2001 to 68% in 2003. To deal with the requirements from the Education and Manpower Bureau such as inspection, conference and seminars, activities and documentation work became the most time consuming and least effective onerous work. There was a sharp increase from 40.7% in 2001 to 88.3%, as reported by teachers. The next increase was with non-teaching work such as dealing with the society, the school running body, school and students which reported 84.7%. Again, there is a sharp increase from 40.3% in 2001. The third area included meetings on school business, subjects, activities and clerical business, administration, reports and documentation were reported by 83.3% of teachers, as compared with 63.9% in 2001. The ten sources of pressure are summarised in the Table 2.8 (HKPTU, 2003):

<table>
<thead>
<tr>
<th>#</th>
<th>Source of pressure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rapidly changing education policy</td>
<td>97.6</td>
</tr>
<tr>
<td>2</td>
<td>Onerous non-teaching work</td>
<td>95.8</td>
</tr>
<tr>
<td>3</td>
<td>Avalanche and Tsunami of teaching duty</td>
<td>92.6</td>
</tr>
<tr>
<td>4</td>
<td>Ever-increasing expectation from society</td>
<td>92.5</td>
</tr>
<tr>
<td>5</td>
<td>Various training and studies, including benchmark tests</td>
<td>90.5</td>
</tr>
<tr>
<td>6</td>
<td>Demands from administrations</td>
<td>89.5</td>
</tr>
<tr>
<td>7</td>
<td>Ever-falling student ability levels</td>
<td>86.4</td>
</tr>
<tr>
<td>8</td>
<td>Job insecurity due to crises of shrinking classes</td>
<td>84.2</td>
</tr>
<tr>
<td>9</td>
<td>Competition among schools</td>
<td>83.7</td>
</tr>
<tr>
<td>10</td>
<td>Requirements for meeting the benchmark tests</td>
<td>80.5</td>
</tr>
</tbody>
</table>

As well as the normal classroom teaching duties, teachers have to mark exercises, test and examination scripts which occupy a lot of their time. They also have administrative and other workloads on which they work long hours (Lo, 2000). They have little time to prepare for using IT in teaching.
2.7.6 CHINESE INPUT METHODS

There are two sets of codes in computer systems for the English language, the internal codes of alphabets, numbers and symbols which are defined by the American Standard Code for Information Interchange (ASCII), and the keyboard codes which are defined by the keyboard controller. Since each internal code is represented by one byte, when a key on the keyboard is pressed, an internal code is generated automatically and input to the computer. For computer users whose language uses alphabets, using a keyboard to input is as natural as using a typewriter.

For Chinese people to input a character into the computer is problematic. The first problem is the internal coding system. As there are over ten thousand characters, it requires two bytes to represent these characters and symbols. Due to political reasons, there are two sets of internal codes for Chinese characters. In Taiwan, an official coding system called Big 5 has become the de facto standard. It uses two bytes to denote 13,053 characters and 441 symbols. In mainland China, the GB2312-80 (Coded Chinese Graphic Character Sets) uses two-byte 7-bit to code 6,763 characters and 619 symbols (Kao, 1991). Each character is represented by a unique code in each system, but the code for the same character in Big-5 is different from that in the GB system. Codes in big-5 can be converted to GB2312-80, but not the reverse due to the simplification of traditional characters. When it comes to inputting the characters into the computer, it is even more problematic. As each Chinese character is a symbol in its own right, it is very difficult to use a scheme which can represent over ten thousand Chinese characters in a combination of a small number of elements, say 26, within a small number of strokes, say five, and having unique representation. Over the years, more than 700 input methods using different combinations of hardware and software solutions have been developed (China Business Information Network, 2000; China Daily (North American ed.), 1996; Davis, 2000; Kao, 1991; Lee, 2003; Ling, 1997; Newsbyte News Network, 1995; Shi & Larson, 1990; Wills & Mulcaster, 1996). Kao (1991) elaborated the situation further.

According to People’s Daily, over 700 different methods for keyboard input of Chinese characters have been published, though only a fraction have actually been implemented. While in part testimony to the rich
variety and complexity of Chinese characters, the abundance of input schemes also indicates the difficulty any single method faces in gaining universal acceptance (p. 16).

Chinese text input is therefore the first and most difficult hurdle in Chinese language processing (McGrath, 1994; Kao, 1991; Lee, 2003). However, there is a de facto standard Chinese input method, the Changjie input method devised by a Taiwanese called Chu Bangfoo. Chu broke the Chinese ideographs into 24 basic components and assigned them to the keys of the QWERTY keyboard. Compared with other input methods, Changjie has the largest number of characters with unique code, so users of Changjie can virtually blind-touch type Chinese characters. Hence it is the fastest input method and used widely in jobs where quick Chinese text entry is required. However, the Changjie input method is difficult to learn and easy to forget (Lee, 2003). So other input methods making use of the capacity of computer power were developed (Tse, Ki, Shum, & Lam, 2004). One variant of the Changjie method is the Simple and Quick method which requires the user to enter the first and the last Changjie components of the character, the computer then displays a list of nine characters at a time with the required first and last components. The user has to choose from the list, or scroll up or down the list to search for the desired character if there are many characters sharing the same first and last components. It takes time to search the list, and causes eye strain for doing data input over a long period of time.

It is even more difficult for young pupils to break the Chinese character into components because some of the Changjie rules are not compatible with the traditional composition of Chinese characters (Hsin, 2002). The young children’s method for character entry is through using writing tablets which make use of pattern recognition (China Business Information Network, 2000; Lee, 2003). Although the efficiency of character recognition has been greatly improved in recent technological developments, writing tablets are still inefficient in the hands of students. The vendors acknowledge that users must write very slowly and carefully to ensure that the tablets will recognise what is being written (McGrath, 1994). Even adults using tablets to enter Chinese text are slow and error-prone (Asiaweek, 1997). For young pupils in primary schools who cannot write Chinese characters properly the success rate of
tablets is low (Asiaweek, 1997; McGrath, 1994). Young pupils became impatient after two or three failed attempts. They will either give up or strike the pen hard on the board to display their discontent.

**2.7.7 WORD-PROCESSORS AND DRAWING PROGRAMS FOR CHILDREN**

To help young children master word-processing, word processors such as The Amazing Writing Machine®, AppleWork for Kids®, KidWorks Deluxe®, Microsoft Creative Writer®, and Write Away!® are specially designed for them. They are simpler to use and have lots of fun features (CALL Centre, 1999). There are also drawing programs for young children such as KidPix® and PrintShop® for children to draw graphics and insert them into the word-processor. All these packages have easy to use buttons or icons so that young children don’t have to learn too much from the standard word-processors and graphic programs.

**2.8 MOTIVATING TEACHERS TO CHANGE**

Motivation refers to the willingness, disposition or persistence that a person displays in certain behaviours. It is different from ability which refers to what a person can do (Kellenberger, 1996; Keller, 1983). Motivating teachers to change their practice will be a major outcome of professional development. In this section, motivation theory will be examined to inform this study. The section considers the reinforcement theory, expectancy-value model, and social cognitive theory. The justification of using self-efficacy as an indicator for levels of computer integration is support with examples of applications in various fields.

Since using IT in teaching is an innovation to be diffused into the school, Rogers’ (1995) diffusion of innovation theory will be examined to seek support to the study.

**2.8.1 REINFORCEMENT THEORY**

Reinforcement theory developed from Thorndike’s (1913) Stimulus–Response framework and the Law of Effect states that behaviour is determined by consequences. Skinner (1974) elaborated the theory and developed the token economies which were used successfully in behaviour
modifications of animals. However, reinforcement theory is rather mechanistic (Stipek, 1998), because it does not take into account concerns with beliefs, feelings, and aspirations. For reinforcement theorists, “motivation is not a quality of the person, but a set of behaviours and their contingencies” (Stipek, 1998, p. 10). Most motivation theorists in the 1960s found that reinforcement theory was unsatisfactory and hence explored other psychological variables such as cognition, emotion, or the environment (Stipek, 1998).

2.8.2 EXPECTANCY-VALUE MODEL

According to Atkinson’s (1964) expectancy-value model, a person is motivated to perform a task because he or she feels the need to do it. However, at the same time, he or she is also weighing up two other factors: whether the task is valuable and if the chance of success is high enough (Atkinson, 1964). If he, or she, thinks that the task is not valuable, or the chance of success is low, he or she may avoid it. The chance of success is the expectancy. According to Atkinson’s (1964) model, the chance of certain behaviour is proportional to the product of expectancy and value of the task. Atkinson’s model had been applied to develop other educational motivational models (Keller, 1983; Pintrich, 1990). To investigate the expectancy of success, researchers developed cognitive models of motivation which placed emphasis on making cognitive decisions based on beliefs rather than on the “need” of performing the task (Weiner, 1979). The expectancy of success was also linked to past achievement (Weiner, 1979, 1980) or perceived past success (Kellenberger, 1996).

2.8.3 SOCIAL COGNITION THEORIES

Social cognitive theorists accept that external reinforcement is a cause of achievement behaviour. However, they also claim that cognition (beliefs) affects behaviour. They posits that beliefs about future reinforcement appear to be more important determinants of behaviour than actual reinforcement histories, and vicarious learning is an important determinant of behaviour (Bandura, 1977a, 1977b; Stipek, 1998). The mutual influences on behaviour, inner personal factors (cognition, emotion, and biological events), and environmental events is called the triadic reciprocality. It is an important
concept in social cognition theory (Bandura, 1986). People respond cognitively, affectively and behaviourally to environmental events, but through cognition, they also exercise control over their behaviour and their inner personal factors (Maddux, 1995).

2.8.3.1 SELF-EFFICACY IN BANDURA'S SOCIAL COGNITION THEORY

Self-efficacy theory was developed by Bandura (1977a, 1977b). It is concerned primarily with the role of personal cognitive factors in the triadic reciprocality model. Bandura (1977a, 1977b) first differentiated outcome expectancy and efficacy expectancy by defining outcome expectancy as “a person’s estimate that a given behaviour will lead to certain outcomes” while an “efficacy expectancy is the conviction that one can successfully execute the behaviour required to produce the outcomes” (p. 79). The expanded definition of self-efficacy is people’s beliefs about their capabilities to exercise control over the events that affect their lives (Bandura, 1986) and their beliefs in their capabilities to mobilise the motivation, cognitive resources, and course of action needed to exercise control over task demands (Bandura, 1997b). Bandura (1977b) listed four sources of information on which efficacy expectations are based upon, namely, performance accomplishments, vicarious experience, verbal persuasion and emotional. “Performance Accomplishments provide the most dependable source of efficacy expectations because they are based on one’s own personal experiences. Successes raise mastery expectations; repeated failures lower them, especially if the mishaps occur early in the course of the event” (p. 81). Vicarious Experience enables most human behaviours to be learned observationally through modelling. “Seeing others perform threatening activities without adverse consequences can create expectations in observers that they too will eventually succeed if they intensify and persist in their efforts” (p. 81). Behaviour can be both enhanced and inhibited by vicarious reinforcement and vicarious punishment. Observers’ positive behaviour increase when they have seen others reinforced while the observed negative consequences reduce the tendency of a similar behaviour (p. 119). Verbal Persuasion is widely used in an attempt to influence human behaviour “because of its ease and readily availability” (p. 82). “Emotional Arousal can influence efficacy expectations in threatening situations. People rely partly upon their
state of physiological arousal in judging their anxiety and vulnerability to stress. Because high arousal usually debilitates performance, individuals are more likely to expect success when they are not beset by aversive arousal than when they are tense, shaking, and viscerally agitated. Fear reactions generated further fear” (p. 82). Maddux (1995) divided emotional arousal into Physical states and Emotional state. Bandura (1977b) pointed out that Situational Circumstances also affect efficacy expectations. “Some situations require more arduous performance and present a higher risk of feared consequences than do others. Success expectations will vary accordingly” (p. 83).

Bandura (1986) suggested that goal-setting and persistence, cognition, affect, and selection of environment are the four mediating mechanisms which influence self-efficacy beliefs. Maddux (1995) suggested that a person’s setting of goals, development of plans and strategies to attain these goals, and rules for predicting and influencing events, and efficiency and effectiveness of problem solving, may be influenced by his or her self-efficacy beliefs.

Teachers’ practices change when their beliefs and attitudes about their practice change (Clarke, Carlin & Peter, 1992; Clarke & Peter, 1993; Clarke & Hollingworth, 1994). Bandura’s (1977a, 1977b, 1986) social cognitive theory suggested that through the applications of performance accomplishment, vicarious experience, verbal persuasion and emotional arousal, teachers’ self-efficacy can be enhanced, which in turn, will change their teaching practices. It may be a useful theory to underpin a professional development model for helping teachers to use IT in teaching. The following discussion examines some of the applications of self-efficacy.

2.8.3.2 APPLICATIONS OF SELF-EFFICACY IN VARIOUS FIELDS

Self-efficacy theory “has generated more research in clinical, social, and personality psychology in the past decade and a half than other such models or theories” (Maddux, 1995, p. 4). Self-efficacy can be used “as the means for exercising control over self-debilitating patterns of thought, emotional distress, and behaviour patterns that impair people’s relationship with themselves and others” (Bandura, 1997, p. 319). Self-efficacy, as thought control of action, is used in health functioning (Bandura, 1997), anxiety and phobic disorders
(Bandura, 1997; Williams, 1995), and teaching and learning (education) (Bandura, 1997; Schunk, 1995; Zimmerman, 1995).

Many researchers studied self-efficacy in various subjects like chemistry (Smist, 1993), computers (Enochs, Riggs, & Ellis, 1993; Moroz & Nash, 1997; Riggs & Enochs, 1993), mathematics (Enochs et al., 1993; Pajares, 1996; Pajares & Kranzler, 1995), peer assisted learning (Watters & Ginns, 1997), science (de Laat & Watters, 1995; Enochs et al., 1993; Ginns & Foster, 1983; Ginns & Watters, 1996a, 1996b; Watters & Ginns, 1995), teachers’ sense of efficacy (Ashton, 1985), and writing (Schunk & Swartz, 1993; Shell, Colvin, & Bruning, 1995). In these studies, self-efficacy has been an effective indicator of personal beliefs in implementing change. Highly self-efficacious teachers have engaged in personal motivation and commitment to specific teaching practices with alacrity. Hence designing effective professional development should focus on enhancing teachers’ self-efficacy.

2.8.3.3 JUSTIFICATION FOR USING SELF-EFFICACY AS AN INDICATOR

Social learning theory has important implications in professional development. Providing vicarious experience through demonstrations and classroom observations of successful performance will increase their efficacy expectation and desire to try. Providing hands-on experience which gives participants successful behaviours will strengthen their efficacy expectation (Bandura, 1977b; Bennett, 1995; McDougall & Bretts, 1997). Facilitating teachers in their selection so that they can have successful experiences will enhance their efficacy expectation. Persuasion from the principal, tutors, leaders, and fellow teachers (peers) will also help. Teachers’ self-efficacy can also be analysed through the selection of the difficulty or simplicity of tasks. A collegial, collaborative and supportive atmosphere will lower teachers’ anxiety and avoid aversive emotional arousal so that they can gain better performance experience. Thus it is appropriate to use Bandura’s (1977a, 1977b) self-efficacy theory to underpin the study.

2.8.4 DIFFUSION OF INNOVATION THEORIES

A study of the history of diffusion models found that there were three periods of development. The first period concentrated on the development of
mathematical basic models, which were used for forecasting by extrapolation. In the second period models were modified to focus on the dimensions of the changing environment, competitive innovations, multi-phase adoption, and interaction between innovations. The main use of these models was still forecasting by extrapolation. In the third period models have expanded the scope and flexibility. The focus has changed from forecasting to a more complicated descriptive use and normative use (Jaakkola, 1996). By comparing the assumptions, uses, characteristics, advantages and shortcomings of various models, Jaakkola (1996) found that the model was always a simplified presentation of the real phenomenon. The availability of the wide variety of diffusion models and variations of them causes problems when choosing the right one. The diffusion of innovation process is perhaps the most widely researched and best documented social phenomenon, with reports of research studies in nearly two dozen distinct academic disciplines, including geography, sociology, economics, and education. Diffusion patterns were investigated in the innovative use of isotopes in U.S. hospitals, computer applications in local governments, credit cards in banks, planned parenthood affiliates in U.S. communities, M-Form administrative structure in industrial firms, basic oxygen furnace in steel manufacturing (Mahajan & Peterson, 1985). Mahajan and Peterson (1985) also noted that “much of the early research on diffusion processes focused on describing observed diffusion patterns in terms of prespecified trend or distribution functions … Therefore, attempts have been made to develop theory-based ‘diffusion models’ for analysing and modelling the spread of an innovation over time” (p. 10).

Rogers (1995) claimed that diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. There are four specific elements in the diffusion process, namely, the innovation, communication channels, time, and a social system (Rogers, 1995).

This study does not concentrate on the mathematical predication of innovation diffusion in education, but uses the research to inform the implementation of the innovative teaching practice in schools and among teachers. The innovation in this study is the integration of IT in classroom
learning and teaching. The communication channels are those shared between teachers. The time of diffusion is measured by the rate, which is measured by the number of teachers who have changed their practice by embracing the innovation in a certain time span. The social system is the group of primary school teachers of the school under study. Rogers’ innovation diffusion theory (1995) is more appropriate for this study.

2.8.4.1 HIGHLIGHT OF ROGERS’ DIFFUSION OF INNOVATION THEORY

Rogers (1995) saw three types of innovation-decision, namely, optional, collective and authority. The innovation-decision process can be divided into five stages, the knowledge, persuasion, decision, implementation, and confirmation stages. In the knowledge stage, potential adopters are given knowledge until they can recall the information, comprehend the message, and finally acquire the knowledge and skills required for effective adoption of the innovation. In the persuasion stage, potential adopters begin to like the innovation and are willing to discuss it with others, and finally accept the message about the innovation. In the decision stage, potential adopters seek additional information about the innovation, and have intention to try the innovation. In the implementation stage, they become adopters and use the innovation regularly and continuously. In the confirmation stage, adopters recognise the benefits of using the innovation, integrate the innovation into their ongoing routine, and promote the innovation to others. Rogers (1995) also divides adopters into five categories, namely, innovators, early adopters, early majority, late majority, and laggards. Innovators are venturesome people who may be in the top 2.5% of the population. Early adopters enjoy the respect of using the innovation and are usually in the next 13.5%. The early majority are those who join the bandwagon later than the innovators and early adopters. They occupy the next 34%. The late majority are the sceptical people who wait and see others’ results before joining in. They are in the next 34%. The laggards are those traditional people who are unwilling to change. They occupy the last 16%.

Whether an innovation can be diffused easily depends on the nature of the innovation which includes relative advantage, compatibility, complexity, trialability, observability and change agents (Rogers, 1995).
2.8.4.2 RELATIVE ADVANTAGE

Relative advantage is defined as the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 1995). The diffusion of an innovation is an uncertainty-reduction process. Potential adopters want to know how much better a new idea is than an existing practice, so relative advantage is often the content of the messages about the innovation. Relative advantage includes the effectiveness of the innovation, mandate and status motivations for adoption, various incentives, and fad.

2.8.4.3 COMPATIBILITY

Compatibility is defined as the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters (Rogers, 1995). Compatible ideas are less uncertain to the potential adopters. Compatibility of an innovation with a previous experience can either speed up or retard its rate of adoption. Previous practice is a familiar standard against which the innovation can be interpreted, thus decreasing uncertainty. The degree to which it meets a need felt by the clients is also an indication of the compatibility of an innovation. If the innovation meets the felt needs, a faster rate of adoption usually occurs (Rogers, 1995).

2.8.4.4 COMPLEXITY

Complexity is defined as the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1995). Although the research evidence is far from conclusive, it is suggested that the more the complexity of an innovation, the lower the rate of adoption (Rogers, 1995).

2.8.4.5 TRIALABILITY

Trialability is defined as the degree to which an innovation may be experimented (Rogers, 1995). Rogers (1995) found that new ideas that can be tried out on the instalment plan are generally adopted more rapidly than innovations that are not divisible.

2.8.4.6 OBSERVABILITY

Observability is defined as the degree to which the results of an innovation are visible to others (Rogers, 1995). Innovations with less
observability usually have relatively slower rates of adoption. Rogers (1995) generalised his observation and postulated that “the observability of an innovation, as perceived by members of a social system, is positively related to its rate of diffusion” (p. 245). Rogers (1995) observation agreed with Bandura’s (1977b) observational vicarious learning where a group of kindergarteners saw a film that showed a young lady kicking a bobo doll repeatedly and shouting “sockeroo!”. Left in a room with these dolls later, a lot of these young children changed their behaviour and kicked and punched the dolls and shouted “sockeroo!”. As kicking, punching, and shouting are observable behaviours, the kids perceived them easily and adopted the behaviours (Boeree, 1998).

2.8.4.7 CHANGE AGENTS

Change agent is defined as the individual who influences clients’ innovation-decisions in a direction deemed desirable by a change agency (Rogers, 1995). The major criticism of the basic diffusion models was the little use of agencies interested in diffusing an innovation because they consider diffusion as a function of time only (Mahajan & Peterson, 1985). Sometimes the introduction of an innovation failed although change agents were used. This is because there are factors in change agent success, including compatibility with clients’ needs, change agent empathy, homophily and change agent contact, and change agent credibility (Rogers, 1995). In the innovation diffusion process, the innovators or the early adopters are usually the change agents (Rogers, 1995).

2.8.4.7.1 Compatibility with clients’ needs

Diffusion programs often fail because change agents are more innovation-minded than they are client-oriented (Rogers, 1995). In order to succeed, change agents must be aware of their clients’ felt needs and adapt their diffusion programs to them. “They should not, however, relinquish their role in developing and shaping these needs, so as to optimise the clients’ welfare in the long run” (Rogers, 1995, p. 341).

2.8.4.7.2 Change agent empathy

Empathy is defined as the degree to which an individual can put himself or herself into the role of another person (Rogers, 1995). When the clients are
extremely different from the change agents, it is especially difficult for change agent to take the roles of (empathise with) his/her clients (Rogers, 1995). Change agents are expected to be more successful if they can empathize with their clients (Rogers, 1995).

2.8.4.7.3 Homophily and heterophily of change agents

Homophily is defined as the degree of similarity in certain attributes of pairs of individuals who interact. Heterophily is defined as the degree by which they differ (Rogers, 1995). Change agents usually differ from their clients in most aspects. It is found that change agents have most contact with clients who are most like themselves. There are more effective communication contacts between change agents and their clients when they are homophilous (Rogers, 1995).

2.8.4.7.4 Change agent credibility

There are two kinds of credibility. Competence credibility is defined as the degree to which a communication source or channel is perceived as knowledgeable, and safety credibility is defined as the degree to which a communication source or channel is perceived as trustworthy (Rogers, 1995). Perhaps the ideal change agent would represent a balance of competence and safety credibility. The best credibility of a change agent is that he or she is homophilous with his or her clients in social characteristics but heterophilous in regard to technical competence about the innovations being diffused (Rogers, 1995).

2.9 STAFF PROFESSIONAL DEVELOPMENT

The Education and Manpower Bureau of Hong Kong (EMB, 1998) claimed that,

there is strong consensus that our school education should be alive to the various opportunities and changing needs of the information age. We should help our students to develop an understanding of the pervasive impact of IT on the society and their daily lives, higher order thinking skills, as well as abilities to seek, evaluate, organise and present information. They also need to develop habits of life-long learning so as to ride on the tides of rapid changes” (p. 1).

However, teachers had not experienced this kind of change when they were trained. Most of them did not have enough knowledge on computers and
IT Integration into Teaching (Leung, Pun, Lai & Tsoi, 1997). Many teachers hold negative attitudes towards computers. With fear, lack of understanding, and negative attitudes, teachers will not be able to provide confident role models to the students as they attempt to teach students how to use computers (Rosen & Weil, 1995). EMB (1998) pointed out that, as “students will quickly outpace their teachers … the role of teachers as a guide and facilitator becomes all the more important” (p. 10). Teachers not only have to master the skills to incorporate IT into their teaching, they have to be able to guide and facilitate student learning. In fact, many teachers are not comfortable with their own technology use and teaching abilities (Jewell et al., (n.d.)), and the Congressional Office of Technology Assessment also concluded that most teachers are poorly prepared to handle the coming influx of technology in the classroom (Jewell et al., (n.d.)). Fortunately, “the overwhelming majority of educators are thoughtful, inquiring individuals who are inclined to solve problems and search for answers to pressing questions” (Guskey, 2000, p. 26).

As there are relative advantages for teachers to learn and use IT in their teaching, many teachers attended the training courses organised by the Education Department, universities and commercial firms. However, from the researcher’s conversation with local teachers and his experience in running seminars and workshops, as well as anecdotal stories, these off-site, short duration training programs were not satisfactory, so he resorted to literature for a better training model to help teachers.

2.9.1 MODEL OF EFFECTIVE PROFESSIONAL DEVELOPMENT

There are different ways of classifying staff professional development models. Dunlop (1990) divided them into “innovation-focused” models and “action-research” models. “Innovative-focused” models include one-shot seminars, microteaching, school-based professional development, basing a curriculum consultant at a school, participation in formal award courses, and workshops. In the “action research” models, participants are encouraged to formally reflect-in-action through planned processes facilitated by a consultant or peer and ultimately reconcile the theory-practice mismatch through personal and ongoing reflection. Sparks and Loucks-Horsley (1990) reviewed five effective staff development models, namely, training, inquiry, observation,
involvement in development/improvement process, and individually guided professional development. Guskey (2000) extended the list to seven by adding study groups and mentoring. From these experts in professional development, as well as other researchers (Bennett, 1995; Fullan, 1982; Joyce & Showers, 1982, 1988; Levine, 1985; McDougall & Bretts, 1997), when all training components are present (theory, demonstration, practice, feedback, and coaching), teachers can acquire new knowledge and skills and use them in their instructional practice when provided with adequate opportunities to learn (Joyce & Showers, 1988). Downes, Fluck, Gibbons, Leonard, Matthews, Oliver, Williams and Vickers (2001) summarised various strategies in integrating ICT in education employed by educational systems into two groups, namely, direct continuing professional development (CPD) strategies and infrastructural components. Direct CPD included sponsorship programs for self-directed formal professional development, school-based/focused programs, single event programs, serial courses, curriculum development or teaching projects, professional learning communities, and sustained inquiry through teacher research projects. Infrastructure components included central and advisory services, teachers’ centres, Navigator/Lighthouse Schools offering mentoring, practicum, courses, allocation of specialist staff to schools, development and provision of resources, provision of hardware to teachers, partnership with teacher education institutions around practicum and induction of beginning teachers, and recognition and certification of learning expertise. An effective staff professional development program should provide teachers with the required knowledge, skills and techniques to enable them to use ICT competently. Downes et al. (2001) also found that effective professional development is rigorous, sustained, long-term, ongoing, intense, directed towards teachers’ intellectual development and leadership, designed and directed by teachers, experiential, engaging teachers in concrete tasks of teaching, assessment, observation and reflection, collaborative and interactional, involving a sharing of knowledge among educators, and grounded in inquiry, reflection, and experimentation that are participant-driven. The model of professional development adopted for this study addresses these issue and characteristics in so far as it included training, observation, program development, individually guided, and inquiry or action research components.
In addition it emphasised teacher participation, collaboration and interactional, peer-support, design, experiential, experimentation, reflection and sharing.

2.9.1.1 TRAINING COMPONENTS

Using IT requires knowledge, skills, techniques, and positive attitudes, and incorporating IT in teaching also requires pedagogical knowledge and skills. There is a need for teachers to acquire these skills to incorporate IT in their classroom. Compared with other professional development programs, Sparks and Loucks-Horsley (1990) and other researchers argue that training in which tutors teach and participants listen is a cost-efficient means for teachers of the whole school or district to acquire knowledge and skills (Gage, 1984; Joyce & Showers, 1988). They also argued that training has the potential to significantly change teachers’ beliefs, knowledge, behaviour, and the performance of their students (Sparks & Loucks-Horsley, 1990). To avoid wasting teachers’ time on something they already know, Duttweiler (1989) suggested the attendance at these training sessions should be voluntary.

2.9.1.1.1 School-based program

Research found that school-based training is the most preferable approach if participants take part in determining objectives (Elam, Cramer, & Brodinsky, 1986; Kong, Au & Pun, 1999, 2000; Kong & Pun, 2000) and have opportunities to be involved in planning the content from the beginning (Levine, 1985). The content can be planned in response to teachers’ assessed needs (Korinek, Schmid & McAdams, 1985; Rogers, 1995) and activities built upon the current understandings of teachers, moving from the known to the unknown (Fullan, 1982). The training should also be classroom-based (Thiessen, 1992), centring on improving the quality of teaching, which empowers teachers and occurs in the complex and changing situation of classroom life.

2.9.1.1.2 On-site program

If the training is on-site, i.e., in the computer room, multimedia language centre and/or classrooms of the school, the site is physically and psychologically comfortable for participants (Department of Employment, Education and Training, 1988), and on-site resources can be fully utilised (McDougall & Bretts, 1997). Evidence from research (Dollar, 1983; Fullan,
suggests that in an on-the-job training program aiming at specific knowledge relevant to a teacher’s location, participants are able to locate a particular activity in a larger context that is directly related to their experiences. Whatever is learned by teachers can be applied immediately in their own classrooms. Teachers can increase their repertoire of teaching techniques after trying successful new practices learned from the training sessions (Sparks & Loucks-Horsley, 1990).

2.9.1.1.3 Ongoing, hands-on and on-the-job training

One-shot seminars for professional development are not effective and should be avoided (Hinson et al., 1989). Ongoing staff development with concrete, teacher-specific and extended training which was spaced weeks apart between sessions and opportunities in classroom practice and peer coaching were more effective (Bennett, 1995; Jewell et al., (n.d.); Joyce & Showers, 1982; McDougall & Bretts, 1997; McLaughlin, 1990; Sparks, 1983). Emphasis on activity-based and hands-on activities could provide teachers with maximum opportunity for involvement and self help (Bennett, 1995; Levine, 1985; McDougall & Bretts, 1997).

2.9.1.4 Peer tutoring and support

Teachers who work with their peers as trainers feel more comfortable exchanging ideas, and play a more active role in workshops (Wood & Kleine, 1987). Psychological safety is a key to effective staff development (Bennett, 1995). Fellow teachers (peers) serve as coaches to one another and activities that are conducted in a climate of trust, peer support and open communication have better results (Brookfield, 1986; Joyce & Showers, 1982). By participation in the process of developing teacher training sessions and the improvement of teachers teaching, tutors become more appreciative of individual differences, more aware of the perspectives of others, and more skilled in group dynamics (Guskey, 2000; Sparks & Loucks-Horsley, 1990). Hence their ‘internal expertise’ is capitalised upon (Hobbs, 1989). Because they are closest to the context and often understand it best, have a strong interest in the problems and issues addressed, they are personally committed to
finding workable solutions, and the solutions or strategies they develop are more likely to succeed (Guskey, 2000). Participants not only increase their specific knowledge and skills, they also enhance their ability to work collaboratively and share in decision making (Guskey, 2000).

Since these tutors are change agents who have a higher knowledge, skills and techniques when using IT than their peers (heterophilous) and are similar to their peers in other aspects (homophilous), they can understand the roles of their peers (empathy) and are compatible with their needs. With their high competence and safety credibilities they are more likely to succeed in the promotion of the innovation (Rogers, 1995).

2.9.1.2 OBSERVATION COMPONENT

Joyce and Showers (1982) suggested that the ongoing performance of teachers should be observed and processes instituted in the school for peer observation, feedback and coaching, to reduce isolation and to generate enthusiasm. There was significant improvement in student learning when the training of teachers in effective instructional practice was followed by observation and coaching in their classroom (Joyce & Showers, 1988). Teachers’ views on effectiveness of teaching rely heavily on their own informal observations (Lortie, 1975). Teaching can be objectively observed and analysed and improvement can result from feedback on that performance. Observation and assessment of classroom teaching can benefit both the observer and the teacher being observed (Sparks & Loucks-Horsley, 1990). The observer gains professional expertise by watching a colleague, preparing the feedback, and discussing the common experience, while the teacher being observed benefits from another’s point of view, gains new insights, and receives helpful feedback (Guskey, 2000). Discussion and peer observation are important training activities (Sparks, 1983), with regular classroom visits to support introduction of new ideas and activities by the classroom teachers (McDougall & Bretts, 1997). These findings confirm that vicarious experience (Bandura, 1977a, 1977b) is important to teachers’ enhancement through observation.
2.9.1.3 INQUIRY AND PARTICIPATORY ACTION RESEARCH COMPONENT

As found by Downes et al. (2001), effective professional development should be experiential, collaborative, interactional, directed and designed by teachers, grounded in inquiry, reflection, experimentation that are participant-driven, this study thus adopted an inquiry and participatory action research component.

From the definitions given by expert in the field, Participatory Action Research (PAR) can be defined as the application of fact-finding (Burns, 1998), using rigorous, systematic inquiry through scientific procedures (McKernan, 1996), to practical problem-solving (Burns, 1998) and investigation of human actions (Elliot, 1978) in a social situation at the classroom or school level (Burns, 1998; Elliot, 1978; Guskey, 2000). PAR carried out by the practitioners (McKernan, 1996) involving the collaboration and co-operation of researcher, practitioners and laymen (Burns, 1998) who have critical-reflective ownership of the process and the results (Kemmis & McTaggart, 1988; McKernan, 1996; McTaggart, 1997). PAR is intent on improving the quality of action within classrooms (Burns, 1998) or deepening the understanding of teachers’ problems (Elliot, 1978; McKernan, 1996) so as to change the beliefs and practice of the individuals and the culture of the groups, school, and the district (Kemmis & McTaggart, 1988; McTaggart, 1997).

PAR explains ‘what is going on’ by relating it to a context of mutually interdependent contingencies, and interprets it from the point of view of those acting and interacting in the problem situation. “Actions and transactions are interpreted in terms of a person’s (a) understanding of, and beliefs about, his/her situation; (b) intentions and goals; (c) choices and decisions; and (d) acknowledgment of certain norms, principles, and values in diagnosing, setting goals, and choosing courses of action” (Elliot, 1978, p. 356).

PAR is a particularly effective means for teacher’s professional development with IT (Somekh & Davis, 1997). Somekh and Davis’s Pupil Autonomy in Learning with Microcomputers (PALM) project “sought to combine computer-mediated curriculum development and teacher professional development in a single action research process” (p. 116). It involved 67
novices or near novice teachers, 34 already using computers fairly regularly in teaching, and 17 very experienced users of computers in teaching. The research included nearly all the subject disciplines. They found that “the value of the inquiry-based methodology of action research adopted by the PALM project lay in its ability to support the IT innovation from its introduction until it was firmly established” (pp. 121-122). They concluded “action research is a practical and effective methodology for promoting effective, long-term use of IT in education” (p. 125).

As the activities are conducted in a climate of trust, peer support and open communication (Brookfield, 1986) and teachers act as action researchers and participant observers (Zeichner, 1983), PAR provides teachers with opportunities to solve and search for answers to pressing questions (Guskey, 2000). PAR also helps them become more reflective practitioners, more systematic problem-solvers, and more thoughtful decision makers (Sparks & Simmons, 1989). Teachers learn about educational research, identify and analyse classroom problems, pursue topics of professional interest, and improve their overall teaching ability (Sparks & Loucks-Horsley, 1990). PAR enhances professional growth, promotes collaboration, and decreases educators’ sense of isolation. Guskey (2000) believed that,

Educational problems and issues are best identified and investigated where the action is: at the classroom or school level ... By integrating research into these settings and engaging those who work at this level in research activities, findings can be applied immediately and problems solved more quickly (p. 46).

PAR can be used by individuals, small groups of educators, or an entire school staff (Guskey, 2000). It narrows the gap between research and practice (Loucks-Horsley, Harding, Arbuckle, Dubea, Murray, & Williams, 1987).

There are some assumptions in the PAR/Inquiry model:

- Teachers are intelligent, inquiring individuals with legitimate expertise and important experience (Sparks & Loucks-Horsley, 1990).
- Teachers are inclined to search for data to answer pressing questions and to reflect on the data to formulate solutions (Sparks & Loucks-Horsley, 1990).
• Teachers have the ability to formulate valid questions about their own practice and pursue objective answers to those questions (Guskey, 2000; Sparks & Loucks-Horsley, 1990)

Guskey (2000) found that “most teachers and school administrators lacked the time and essential skills in research methodology to carry out needed studies” (p. 46), so the problems that could be investigated in a short time period were relatively trivial, and the benefits of such efforts rarely justified the cost. Depending on the complexity of the problem addressed, it also can require the commitment of substantial time as well as significant initiative on the part of the individuals involved (Guskey, 2000). Teachers should be allowed a reduced amount of on-class time to participate in the activities (Cranston, Dungan & Grieve, 1989).

2.9.2 “GRASSROOTS” PROFESSIONAL DEVELOPMENT MODEL

To provide the opportunities for teachers to experiment using ICT in their teaching, to get answers to their inquiries, and to share their experience among participants, it was necessary to find from the literature a structured way for this end.

Bleicher, Cooper, Nisbit and Warren (1996) summarised the findings of a successful professional model devised by Clandinin and Connelly (1991), Connelly and Clandinin (1990), Diamond (1991) and Fraser (1990) into a set of strategies for professional development, shown in the right column of Table 2.9. The set of strategies devised by Bleicher et al. (1996) are similar to the seven strategies for mutual adaptation quoted by McLaughlin (1990) from the Rand Change Agent Study in the left column of Table 2.9.
Table 2.9

*Effective strategies in professional development.*

<table>
<thead>
<tr>
<th>Strategies for Mutual adaptation (McLaughlin, 1990)</th>
<th>Strategies for Professional Development (Bleicher et al., 1996).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete, teacher-specific and extended training.</td>
<td>Worthwhile and enduring change is a slow process that requires commitment and risk from teacher.</td>
</tr>
<tr>
<td>Classroom assistance from local staff.</td>
<td>Teachers need collegial support in the form of regular meetings and discussions.</td>
</tr>
<tr>
<td>Teacher observation of similar projects in other classroom.</td>
<td>Teachers’ perceptions of successful and improved students learning are crucial to the success of the change process. Experience and reflection are necessary for effective change and input from sources outside the school to facilitate this reflection and to clarify and introduce different ways of considering situations.</td>
</tr>
<tr>
<td>Regular project meetings that focus on practical issues.</td>
<td>Teachers need experience with new strategies before they will change their attitudes and beliefs to them (awareness and knowledge of new strategies is not sufficient for their adoption to the classroom).</td>
</tr>
<tr>
<td>Teachers’ participation in project decision.</td>
<td>Teachers’ prior beliefs and attitudes are important elements in the change process.</td>
</tr>
<tr>
<td>Local development of project materials.</td>
<td>Senior school staff support and commitment is a crucial component of successful school change.</td>
</tr>
<tr>
<td>Principals’ participation in training.</td>
<td></td>
</tr>
</tbody>
</table>

The model from Bleicher et al. (1996) consists of four levels of action and five components. The four levels of action of the model are: (1) the researcher; (2) the leaders; (3) the facilitators and (4) the teachers (Figure 2.1).

![Figure 2.1 Four-level structure of “Grassroots” model](image-url)
The five components of the “Grassroots” Model of Bleicher et al. (1996) are (1) project team; (2) key persons; (3) facilitators; (4) resources; and (5) network, as shown in Table 2.10.

**Table 2.10**

*The five components of the “Grassroots” professional development model.*

<table>
<thead>
<tr>
<th>Component</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Team</td>
<td>Researcher, principals and senior teachers who may also be key persons</td>
</tr>
<tr>
<td>Key Persons</td>
<td>Teachers who are willing to organise and assist the facilitators</td>
</tr>
<tr>
<td>Facilitators</td>
<td>Teachers who have experience in using computers for their own subject areas and are willing to assist fellow teachers</td>
</tr>
<tr>
<td>Resources</td>
<td>Course materials and training programs to support facilitators</td>
</tr>
<tr>
<td>Network</td>
<td>Communication between ED, HKIEd and schools</td>
</tr>
</tbody>
</table>

### 2.10 FRAMEWORK OF THE STUDY

Informed by the literature, the study adopts two components, the first one is a series of school-based, on-site, ongoing training sessions designed and taught by teachers themselves which aims at providing teachers with the required knowledge, skills and techniques of ICT to enable teachers to use ICT effectively in their teaching. The second component is an adaptation of the “Grassroots” model developed by Bleicher et al. (1996). The model is chosen because it is participant-driven, sustained, long-term and ongoing, collaborative, experiential, and grounded in inquiry, reflection and experimentation. It is school-based because teachers and the principal recognise that incorporating IT in teaching is a worthwhile and enduring change, are committed to take the risk, and there is teachers’ participation in project decision (McLaughlin, 1990). Fellow teachers plan and develop the contents of the training sessions. Peers teach the training sessions. Teachers’ prior beliefs and attitudes are considered as important elements in the change process (Bleicher et al., 1996). The principals also participate in the training and the activities (Bleicher et al., 1996; McLaughlin, 1990). The activities are carried out in the computer room, multimedia language centre and classrooms of the school, so it is on-site. As
teachers need to attain the required IT competency and to experience with new strategies before they change their beliefs and attitudes (Bleicher et al., 1996), there is hands-on practice after each session. There will be concrete, teacher-specific and extended training (McLaughlin, 1990) and ongoing trial and support for two years. Four to five teachers form a group according to their major subject. There is a leader in every group who also serves as the facilitator. The group leaders report to the IT Coordinator who collects the data and liaises with the researcher. Teachers are required to set their goals for using certain strategies incorporating IT in their teaching (plan), try them out in class (act), observe the effects and problems and obstacles and record them in the timetable (observe), and try to find out a better way to remove or minimise the effects of the problems or obstacles (reflect) by seeking help and advice from the leader and sharing with team members for collegial support during the weekly regular PAR meetings (Bleicher et al., 1996; McLaughlin, 1990). There is classroom assistance from local staff (McLaughlin, 1990). There are also class observations by fellow teachers and the researcher so that constructive feedback can be given to advise the teacher being observed, and observers too will have other perspectives of teaching using the strategies incorporating IT. It is situational because it focuses on teachers’ perceptions of successful application of IT in their teaching in the classroom to improve student learning. It is also collaborative because all teachers from the school, the principal, and the researcher will work together. Teachers will take an active part in the study (participatory) and have to reflect their progress in attaining their own goals by reporting their level of integration on the timetables (self-evaluative) (Burns, 1998). In short, the model of professional development for the study is a school-based, on-site, ongoing program with peer tutoring, hands-on training sessions and participatory action research activities. The four levels of action are slightly modified from the Bleicher et al. (1996) model by combining the facilitator and the leader, and all leaders report to the IT Coordinator who collects the data and liaises with the researcher, as shown in Figure 2.2.
Similar to the Bleicher et al. (1996) model, there are also five components in this model as shown in Table 2.11. The first component is composed of the project team which involves all the participating teachers and the principals, as well as the researcher. It is thus participatory. The second component is the group of tutors who are IT team members. They work with the participating teachers to determine collaboratively the content of the training sessions and take up the teaching according to their strength to meet teachers’ expectations. The third component is the group of experienced IT-using teachers who are the leaders of the participatory action research groups of each subject. These teachers can be members of the IT team. The fourth component consists of the resources from the publishers, the IT in Education Network (ITEN, 1998), the Hong Kong Education City (HKEdCity, 2001), the Education Department of Hong Kong, and the market. The last component is the communication network between the teachers, the school, the Hong Kong Institute of Education, the Education Department of Hong Kong, and the community, “a network of sharing of knowledge among educators and a focus of teachers’ communities of practice” (Downes et al., 2001, p. 19).

There are another two theories underpinning the framework of the study, namely, Bandura’s (1977a, 1977b, 1986) Social Cognition theory and Roger’s (1995) Innovation Diffusion theory. Following the social cognition theory, the study places emphasis on observational learning by providing participants with vicarious experience through demonstrations in training sessions and classroom observations. There are hands-on activities for teachers to gain performance experience and to achieve the required competence. The school authority also schedules different weeks of trial teaching for different subjects, giving
teachers opportunities to incorporate IT into their teaching together, forming a culture. The researcher, the principal, subject panels, tutors, leaders of the PAR groups, and the IT Coordinator all use verbal persuasion to encourage teachers to take risks. Through recording strategies incorporating IT in teaching on the timetables, and experience-sharing at the PAR meetings, teachers have to use their imaginal experience to visualise possible situations and events. A collegiate and collaborative atmosphere creates positive physical and emotional states for the adoption of the innovation. All these determinants of self-efficacy are enhanced to facilitate the change in teachers’ behaviours. Viewing from the innovation diffusion model, the relative advantages of the innovation - integrating IT into teaching, include the effectiveness in teaching and improving students’ learning, meeting the mandate from the authorities, establishing status and fad, as well as the advantages mentioned in Section 2.4. Integrating IT into teaching successfully is a felt need of the teachers, the innovation is therefore perceived compatible by the participants. It is a complex activity which is manifested in a variety of ways. Teachers can choose different strategies incorporating IT into teaching, from classroom presentation in the traditional teacher-centred paradigm where the teacher is in full control and didactic ways with IT as tools to arouse interest and improve understanding, to the inquiry, guided discovery, constructivist, student-centred paradigm where students take full responsibility for the use of IT as tools to improve their learning. Teachers have different teaching styles and may have different degrees of integration of IT in their teaching, therefore there are different complexities to choose from, which are within their understanding and grasp. Teaching incorporating IT can be tried and observed easily in the classroom.
Table 2.11
The five components of the current professional development model.

<table>
<thead>
<tr>
<th>Component</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Team</td>
<td>Researcher, principals, IT Coordinator, and participating teachers</td>
</tr>
<tr>
<td>Tutors</td>
<td>Teachers who are willing to organise and conduct training</td>
</tr>
<tr>
<td>Leaders</td>
<td>Teachers who have experience in using computers for their own subject areas and are willing to serve as group leaders</td>
</tr>
<tr>
<td>Resources</td>
<td>Course materials from publishers, ITEN, HKEdCity, ED and the market</td>
</tr>
<tr>
<td>Network</td>
<td>Communication between ED, HKIEd and schools</td>
</tr>
</tbody>
</table>

Innovation
Use of IT in teaching

<table>
<thead>
<tr>
<th>Relative Adv.</th>
<th>Clients’ Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatibility</td>
<td>Empathy</td>
</tr>
<tr>
<td>Complexity</td>
<td>Homophily</td>
</tr>
<tr>
<td>Trialability</td>
<td>Heterophily</td>
</tr>
<tr>
<td>Observability</td>
<td>Credibility</td>
</tr>
</tbody>
</table>

Innovation Diffusion Theory

Participatory Action Research

Questionnaire
Demographics data, IT skills, self-efficacy,

Bleicher Model

Timetables
No. of strategies, periods, weeks

Questionnaire
Demographic data, IT skills, self-efficacy

Figure 2.3 Research model.

The change agents (Rogers, 1995) are IT team members who are fellow teachers and assume the role of tutors. They know their clients’ needs and can put themselves into the role of the participants as classroom teachers (empathy). The tutors differ (heterophilous) from the participants in technology level, therefore they can help the participants. However, they also interact similarly (homophilous) and therefore they can communicate effectively on topics related to incorporating IT in teaching. These tutors have both high competence and safety credibility because they are regarded as knowledgeable and trustworthy by their fellow teachers. Figure 2.3 illustrates the framework of the study. The arrows in the figure indicate how a component is affected by the other ones.
The main part of this study is about how a school-based, on-site and ongoing program with training sessions plus PAR activities and applications of IT in teaching affect teachers’ self-efficacy and their perception of IT skills by looking at the frequency of use of computers, the number of strategies, periods and weeks in which they incorporate IT in their own teaching.

2.11 CONCLUSION

In this chapter, literature on the views of the opponents, the successful examples, and the advantages of using IT in teaching and learning is reviewed so as to establish the premise that incorporating IT in teaching is helpful to teachers and students and therefore worthwhile to do. By analysing and synthesising the different ways of classifying and categorising IT usage in the classrooms, the literature informs a repertoire of using IT in teaching and learning with which teachers can have a concrete list of strategies to choose from in their attempts to incorporate IT in teaching, as explained in Section 3.4.3.3 in the next chapter. The literature also provides rich information on the context of education in Hong Kong. The subject-based, examination-oriented, norm-referenced, highly segregated, performance-oriented culture, textbook-based and schedule-tight teaching within the teacher deficit model, as well as the pressure from demanding parents, press teachers adopting the teacher-centred, expository approach of teaching. Severe limitations in the spatial accommodation of machines and people, conferences, seminars and workshops of frequent education reforms, heavy workload, plus the difficulty in Chinese text entry have made using IT in teaching very difficult. However, Bandura’s (1977b) Social Cognitive Theory and Rogers’ (1995) Diffusion of Innovation theory provide strong support underpinning the study. Informed by the professional development research, a school-based initiative with a school-based program of school-based, on-site and ongoing training sessions planned collaboratively and conducted by fellow teachers as tutors, demonstrations and hands-on experience, and PAR activities was developed. This background provides a framework for exploring the main aims of this study.

As stated in Chapter 1, this study will seek to determine the antecedent
and contextual factors that influence current practice. The study will also explore the change in teaching practice that can be effected through a school-based, on-site professional development program with ongoing support through action research cycles. This phase of research will explore perceptual and behavioural changes regarding the incorporation of IT in classroom teaching through questionnaire surveys, timetable reports, classroom observation and interviews. Informed by literature and data collected through various activities like questionnaire surveys, timetable reports, formal and informal interviews, and classroom observations, the research questions may be answered by examining the indicators of teachers’ changes in their frequency of using IT, perceptions of their own IT skills, self-efficacy, and numbers of strategies, periods and weeks incorporating IT in teaching. The sustainability of the change well beyond the intervention will also be studied.
CHAPTER 3 METHODOLOGY

3.1 CHAPTER OVERVIEW

This chapter describes the research methodology adopted in this study. The justification and significance of this study in the context of Hong Kong education was established in Chapter One while an analysis of previous research and other contextual factors to be considered as impacting on integration of information technology into teaching and learning was also discussed in Chapter Two. Thus the driving forces, needs of teachers, constraints and theoretical issues that influence the ways that teachers and schools can incorporate IT into teaching and learning have been documented. This background suggests that considerable change in practices is necessary in the context of Hong Kong to achieve the goal of embedding IT. To facilitate such change the research literature supports a professional development model in the form of a school-based, on-site and ongoing initiative involving fellow teachers as tutors and adopting participatory action research activities. This study investigates the proposition that such a professional development model is effective in helping teachers integrate IT in teaching.

A case study design has been adopted in order to systematically inquire into the impact of the proposed model of professional development on teachers’ implementation of IT in teaching. Section 3.2 describes the research design and argues for the Case Study approach. Section 3.4 outlines the Methods and includes a discussion of both qualitative and quantitative data collection procedures.

The following discussion describes the reasons for the selection of the research methodology and the details of each component of the methodology including the review of the context, the intervention, data collection, processing and analysis, development and validation of instruments, limitations and research ethics. A time-line is presented to indicate the stages of the study. Research issues and generalisability of the results will also be discussed. A summary concludes the main points developed in the discussion at the end the chapter.
3.2 RESEARCH DESIGNS

Research is a systematic approach to understanding the behaviour of our universe. Research design addresses the planning of scientific inquiry. A brief review of different research designs enables the selection of a research design most suitable for the study.

3.2.1 VARIOUS RESEARCH DESIGNS AND RESEARCH STRATEGIES

A dominant tradition of inquiry that has emerged in our endeavours to understand the universe has come to be characterised as the Scientific Approach and is widely adopted in the physical and natural sciences (Burns, 1998; Graziano & Raulin, 1997). However, this tradition has proven to be less satisfactory in the social sciences where it has become accepted that an individual’s construction of social reality is more subjective than the behaviour of isolated systems in research in the natural sciences. The importance of these subjective experiences of individuals is recognised by the adoption of naturalistic approaches to research that account for the presence and beliefs of the researcher and the complexity of social interactions. Hence, other traditions have emerged in recent times across a range of fields including social, anthropological, psychological and educational research (Burns, 1998; Glesne & Peshkin, 1992; Wiersma, 1991).

Table 3.1
Relevant situations for different research strategies.

| This table is not available online. Please consult the hardcopy thesis available from the QUT Library |

There have been a number of attempts to characterise contemporary social research as drawing upon a diversity of approaches or designs each with its own assumptions about knowledge and the process of developing knowledge. For example, Wiersma (1991) described five types of research designs, namely,
experimental research, quasi-experimental research, survey research, historical research, and ethnographic research. Sproull (1995) grouped survey and ethnographic research and divided research designs into four types, namely, true experimental, quasi-experimental, non-experimental, and historical. Yin (1994) called these designs research strategies and classified them into five strategies according to the research questions, control over behavioural events and focus on contemporary events. The five strategies are experiment, survey, archival analysis, history and case-study, as shown in Table 3.1.

3.2.2 EDUCATIONAL RESEARCH

Within educational research, there is tension between scientific approaches and qualitative approaches. The key characteristics of the scientific approach include the existence of controls, operational definitions, replication and hypothesis testing, which draws heavily on quantitative data and statistical analysis of data in order to generalise findings. In contrast, qualitative approaches stress “the validity of multiple meaning structures and holistic analysis, as opposed to the criteria of reliability and statistical compartmentalisation” (Burns, 1998, p. 11). Qualitative research recognises the importance of subjectivity and involves inquiry into problems, the development of designs to elicit information or data and inductive interpretations emerging and being revised along the way. Qualitative research allows the researcher to approach the inherent complexity of social interaction and to do justice to that complexity, and to respect it in its own right (Glesne & Peshkin, 1992). The traditions of qualitative research have emerged from a range of fields and philosophical orientations. Qualitative inquiry emerges in ethnography, interview research, action-research, case-study, historical research, biography, grounded-theory or phenomenology (Burns, 1998; Creswell, 1994).

Hence this study adopts a case-study design in which the impact of a professional development program was evaluated using both qualitative and quantitative data. These data provided detailed descriptions of the complexity of the case in its total context and over a long period of time. The complexity and richness of a school undergoing change facilitated by a professional development strategy provided an abundance of data sources enabling a mixed methods approach to data collection.
In education and other research, a mixed methods approach to data collection has emerged as a popular research strategy to legitimise both qualitative and quantitative research (Creswell, 2003). In the mixed methods approach, the research tends to base knowledge claims on pragmatic grounds (consequence-oriented). The strategies of inquiry involve the collection of numerical information and text information simultaneously or sequentially to best understand the research problems (Creswell, 2003).

3.3 CASE-STUDY

Case-study is a comprehensive research strategy comprising all-encompassing method from logic of design incorporating specific approaches to data collection to data analysis (Yin, 1994). It is somewhat higher-constraint than naturalistic observation because the researcher does intervene with the subject’s functioning to some degree (Graziano & Raulin, 1997), and it is an approach that studies the cases under consideration in detail and depth. The methods case-study employs include interviews, participant observation, and field studies. The goals of case-study are to reconstruct and analyse a case from a set of interactions, as common behaviour patterns, or as structures (Hamel, 1993).

3.3.1 WHY USE CASE-STUDY?

Case study is linked to case history (Hamel, 1993). They both try to answer the “how” and “why” questions (Table 3.1). The value of case-study can be seen from Table 3.2 (Graziano & Raulin, 1997).

Case-study provides a way to investigate new areas, discover contingencies, and understand the impacts and identify the changes (Yin, 1994), so case-study was employed in the current study.

3.3.2 CASE-STUDY DESIGN

Case-study can include both single and multiple-case studies. It can also be holistic or embedded. When a case study involves only one unit of analysis, it is a holistic case study. If it involves more than one unit of analysis, it is an embedded case study (Yin, 1994).
Table 3.2  
*The value of low-constraint research.*

<table>
<thead>
<tr>
<th>Naturalistic and case-study research is useful:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When we are beginning to investigate a new area in which little information is available.</td>
</tr>
<tr>
<td>2. When the researcher wishes to gain familiarity with typical characteristics of settings or subjects before planning higher-constraint research for similar settings or subjects.</td>
</tr>
<tr>
<td>3. When the study is of a single individual, group, or set of events, and the questions are specific to those people, settings, or events.</td>
</tr>
<tr>
<td>4. As a way to discovering contingencies that can then be used as a basis for higher-constraint questions and research.</td>
</tr>
<tr>
<td>5. When, on completing high-constraint research, we want to know if the relationships we have discovered and demonstrated under the laboratory conditions hold true for behaviour in the natural environment.</td>
</tr>
</tbody>
</table>

Further, naturalistic and case study research can provide

| 1. Description of events, including events never before observed. |
| 2. Identification of contingent relationships among variables. |
| 3. Bases for hypotheses to be used in higher-constraint research. |
| 4. Observation to negate general propositions; low-constraint research cannot establish general propositions or causal inferences. |

Adopted from Graziano and Raulin, 1997, p. 132.

### 3.4 METHODS AND PROCEDURES

This research study aims to develop and implement a model of professional development that helps teachers integrate IT in teaching. It documents and explains the changes in teachers’ beliefs and practices in using information technology in the curriculum during and after a professional development initiative. Hence two features constitute the case study. Firstly, a professional development strategy was implemented. Secondly, qualitative and quantitative data were collected to monitor impact. Details of the professional development intervention and accompanying strategies are provided below.

To evaluate the effectiveness of the professional development initiative, an appropriate research design needs to adopt an approach in which quantitative data provide overall trends and changes while qualitative data enabled the researcher to describe the change in teachers’ beliefs and their teaching practice in a detailed, rich, in-depth, fine-grained descriptive format. The contextual factors can be traced through the archives and the researcher’s observation so that the richness and complexity of change processes can be
elicited in a specific social and cultural context. Informed by the literature, the mixed methods approach was chosen as the data collection strategies (Creswell, 2003; Greene, Caracelli, & Graham, 1989; Yin, 1994). Thus there were three components in this design, namely, quantitative, qualitative and archival analysis.

The setting, the participants involved, as well as the three components of the study will be presented in the following sections.

3.4.1 THE SETTING OF THE STUDY

In 1999 and early 2000, although schools and teachers felt the need to use IT in teaching, it was not easy to get the full support of the school authorities, the principal and the teachers to embark on a research study. The principal and teachers of Philanthropy Primary School were willing to try. This school constituted the case of the study. It is typical whole-day school with 40 teachers and 28 classes and is located in the residential area of medium-low economical status in the Kowloon peninsula of Hong Kong.

3.4.2 PARTICIPANTS OF THE STUDY

The teachers of the Philanthropy Primary School agreed to participate in the study. They were put into Participatory Action Research (PAR) groups and attended the talks, seminars, workshops, training sessions, and PAR meetings. The role of PAR will be described below. The teachers responded to survey instruments and completed timetables on a regular basis over the two years. They cooperated with the research in their interviews and classroom observations. Because there was mobility in the school staffing, teachers came and went over the years. Furthermore, some of the survey data were not complete. Hence the effective number of teachers whose data were acceptable for analysis was reduced to 31. These 31 teachers provided a rich database. The experiences of four of these are detailed as individual cases as described below.

The researcher also played a significant role in this study. The relationship between the researcher and the participating teachers was important from a number of perspectives. Depending on the situation, he was a non-participant observer while at other times he was a participant observer or an observer who participated. Participant observation required a total
involvement in the activities of the research situation whereas participation by
an observer enabled a looser connection by the researcher with the situation.
His close involvement in supporting professional development, providing
formal workshops, visiting classrooms, and facilitating PAR sessions meant
that he was able to develop a close rapport with the staff and gain deep insights
into the dynamics and culture of the school. The researcher took a soft-line
position as participant observer in that the need to be there as an observer was
recognised but the researcher “did not feel constrained to share in the activities
of the researched in a direct and complete way” (Burgess, 1985, p. 25).

3.4.3 THE THREE COMPONENTS OF THE STUDY

This study adopted a case-study research design with three components in
data collection, namely, archival analysis, qualitative data and quantitative
data.

3.4.3.1 ARCHIVAL ANALYSIS – CONTEXTUAL AND THEORETICAL FACTORS

To identify what contextual and theoretical factors can contribute to the
effectiveness of the model of professional development in Hong Kong, the
researcher used archival analysis of government documents, circulars,
memorandums, school documents, observations by researchers published in the
literature. The findings were triangulated with the researcher’s own observation
and the actual measurements. The incentives and barriers affecting the
implementation of IT incorporation in teaching in Hong Kong were identified.

3.4.3.2 QUALITATIVE DATA - CASE-STUDY

This is a single-case with embedded multiple-case research design. As
mentioned in section 3.4.1 on the setting of the study, the single case is a
primary school in Hong Kong. The embedded multiple cases are the four cases
selected out of 12 teachers who were interviewed based on the criteria of low
and high self-efficacy and high and low frequency of using IT after the first
year of the intervention.

3.4.3.2.1 Selection of cases

The four cases were selected according to the following criteria:

• Case one was a teacher representative of a group of experienced male
teachers who were keen to adopt IT in their teaching. He had a low self-efficacy but a large number of applications of strategies incorporating IT in teaching.

- Case two was a teacher representative of those young teachers who had done 120-hour advanced or other IT courses. He had high self-efficacy, high perceptions of his IT skills, and high frequency of applications of strategies incorporating IT in teaching.

- Case three was a teacher representative of a group of young female teachers who were enthusiastic, had high self-efficacy, and were prepared to use IT in teaching.

- Case four represented a group of female senior teachers who were apprehensive, out of touch with technology, and hence had low self-efficacy and low frequency of application.

3.4.3.2.2 Collection of data

Following Yin’s (1994) recommendations, three principles of data collection were observed. The first strategy was to use multiple sources of evidence. There are six sources of data collection for case studies, namely, documentation, archival records, interviews, direct observations, participant-observation, and physical artefacts (Yin, 1994). In this study, data were collected through these six sources. Documentation included school notices, meeting agendas and minutes, computer room and Multimedia Learning Centre booking records, announcements and the school website. Archival records included service records, organisation records, list of teachers’ names, photographs of teachers, sitting plans, and teaching assignments. The interviews were audio-taped and transcribed. Direct classroom observations by the researcher and participant-observation by group leaders or teachers were video recorded and transformed into VCD and MPEG files. The artefacts produced by teachers included their portfolio, teaching materials, and multimedia presentations.

The second principle was creating a case study database. Case study notes, documents, tabular materials and narratives from interview records were used to build the database. The qualitative data were detailed, rich, in-depth, and
fine-grained. The quantitative data also provided rich numerical descriptions of participants’ practices, beliefs and perceptions.

The third principle was to maintain a chain of evidence. Data were recorded systematically so that an external observer could follow the derivation of evidence (Yin, 1994).

3.4.3.2.3 Analysing evidence

Classroom observations were also undertaken. These were conducted as unobtrusively as possible. Videotapes and observation notes were taken. Transcriptions derived from interviews were studied, compared and categorised. Videos from classroom observations, teachers’ portfolios, personal records, and artefacts were examined intensively and emerging issues were grouped into categories. Pattern-matching and comparison of similarity and difference were analysed (Yin, 1994). Problems and difficulties relating to classroom computers, software problems, available peripherals, equipment failure, IT skills, training, and possible solutions were identified.

Two general strategies (Yin, 1994) were employed to analyse the data. The first one was relying on theoretical propositions. Bandura’s Social Cognition Theory (1977b) and Rogers’ Diffusion of Innovation Theory (1995) provided a theoretical framework for data analysis. Collection of quantitative data from surveys and timetable reports and qualitative data from interviews and classroom observations were undertaken and evidence of congruence with these theoretical frameworks sought.

The second strategy was to develop a description framework for each case (teacher) so that their interviews were centred on similar themes. Here, the researcher adopted interpretative approaches to document the changes in teachers’ beliefs and practices where the guiding theories on cognition and innovation were refuted. This approach enabled analysis and explanation of a multiplicity of preferences, motivations, actions, classroom dynamics and teaching approaches.

The modes of analysis (Yin, 1994) were pattern matching and explanation building. The predicted patterns were assumed prior to data collection. So data could be related to the theories and the desired behaviour patterns. Data from
interviews and classroom observations could give explanations to quantitative findings. When the script of an interview is referenced, a code with the first letter to denote the person, the second letter to denote the interview and the third number to denote the order of the discourse or the time of the speech is used. For example, (Ka: 4) means the fourth statement made by Ken in the first interview. (Db: 15) means the 15th statement made by David in the second interview. (Fc: 05:23) means the statement made by Flora in her third interview at 5 minutes 23 seconds.

By comparing the four cases and the overall, school-wide data obtained through questionnaire and timetables, any abstraction, condensation, categorisation or sublimation of data which might lead to some general theorising related to the effects due to the intervention was observed.

3.4.3.3 QUANTITATIVE COMPONENT - SURVEY

Surveys utilise some basic procedures to obtain information from people in their natural environment. It imposes some constraints on subject by presenting to them a set of questions in the form of a specific survey instrument (Graziano & Raulin, 1997). Survey methods usually employ a range of interviewing, questionnaire and attitudes scale procedures (Burns, 1998). Virtually any human issue can be surveyed (Graziano & Raulin, 1997, p. 143). Cross-sectional and longitudinal studies using questionnaires and structured interviews for data collection in surveys can generalise from a sample to a population (Creswell, 2003).

There are two types of surveys, namely, status survey and survey research. Status survey seeks the information in a form of description of the current status of some population characteristics, while survey research seeks not only the current status of population characteristics but also tries to discover relationships among variables (Graziano & Raulin, 1997).

The major steps in survey research are shown in Table 3.3.

In the construction of items, the responses can be in Differential Scales, Likert Scales, and Semantic Differential; each has its advantages and disadvantages (Burns, 1998).

Certain information needs to be collected from all participating teachers.
and the most economical way of achieving this is through the use of a survey. To accomplish this end, two instruments were used in the surveys of the study.

Table 3.3
Major steps in survey research

This table is not available online. Please consult the hardcopy thesis available from the QUT Library

**3.4.3.1 CITITEBI**

The first survey instrument used for data collection in the study was a questionnaire called the Chinese Information Technology Integration in Teaching Efficacy Beliefs Instrument (CITITEBI), as shown in Appendix A. This questionnaire was developed by adopting the Microcomputer Utilisation in Teaching Efficacy Beliefs Instrument (MUTEBI) developed by Enochs and Riggs (Enochs, Riggs, & Ellis, 1993, Riggs & Enochs, 1993). There are three parts in this questionnaire. The first part contains the demographic data of the participants such as gender, age group, IT knowledge, skills and experience, years of teaching experience, and subjects taught. The second part of the questionnaire focuses on teachers’ perceptions of their own IT skills. The third part aims at measuring teachers’ level of Self-Efficacy (SE) in using IT in their teaching. Self-Efficacy in integrating IT in teaching is the conviction that the teacher can successfully incorporate IT into her or his teaching to produce an effective lesson (Bandura, 1977b). The CITITEBI was validated using a survey of 37 primary schools with 975 returns out of 1249 teachers surveyed in the Shatin District of Hong Kong (Leung & Chui, 2001). Some of the items appropriate to the study were selected and used in this version of the CITITEBI. As time progressed, modifications were made to the questionnaire, as shown in Appendices A to C.

In order to see the changes in beliefs due to the implementation of the professional development initiative over two years, the questionnaires were
administered before, after one year and at the end of the second year.

3.4.3.2.2 Timetable report

Teachers in Hong Kong were generally unfamiliar with the strategies incorporating IT in teaching before the study commenced in 2000. To assist the teachers at Philanthropy, the researcher developed a document containing a repertoire of 16 strategies depicting how IT could be incorporated into teaching. The information for this document was derived from literature mentioned in Section 2.5 and in Tables 2.1 to 2.5 and from personal experience from observing classroom practices in Hong Kong over a number of years. It adopted some of the categories described in Veen (1995) but included strategies like using IT as a motivation tool, as an explanation tool, as reward, and as a remedial teaching tool. After teachers used the prescribed strategies in their teaching, they might be able to devise or invent their own innovative teaching strategies incorporating IT. They can then add their strategies to the list. The descriptors of the repertoire of strategies incorporating IT in teaching are presented in Table 3.4 below.

As evidence of changes in teaching practice, it was necessary to document the ways teachers employed IT in their teaching. A regular teacher’s timetable was redesigned as an instrument to document the frequencies of implementation of various strategies and the levels of implementation as defined in the repertoire of strategies in Table 3.4. On the timetable of each teacher, the repertoire of strategies and spaces for information related to teaching were provided. A copy of the timetable used is included in Appendix D.

For example, if a teacher decided to explore a particular strategy, he or she would identify the strategy, plan appropriate goals and implement it. To save time and effort, teachers could record their actions by putting numbers corresponding to the strategies in the space for that lesson, and record in the designated space the teaching material(s) used, their reflections on the strategy, problems encountered, and how they solved the problems.

There was space provided on the timetable for teachers to add any innovative applications of IT in teaching not identified on the repertoire of
strategies. Teachers were required to enter their data on the timetable immediately after they finished the lesson, and the timetables were returned to the researcher each week. The data were stored in a spreadsheet for analysis.

Table 3.4

<table>
<thead>
<tr>
<th>No.</th>
<th>Strategy</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0)</td>
<td>No use of computers in teaching</td>
<td>The teacher uses teaching methods ranging from didactic, to Socratic, guided discovery to independent learning, but without computer.</td>
</tr>
<tr>
<td>(1)</td>
<td>Class presentation by teacher, in</td>
<td>Instead of using “chalk and talk”, the teacher uses IT as presentation tool, notably presentation files developed on latest version of Microsoft</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PowerPoint® which can have multimedia effects. Pictures, photographs, video, music and speech clips replace writing and drawing on the chalk or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>white board. With professionally designed screen display, high quality graphics and sound, teachers can arouse students’ interest, attention and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>motivation.</td>
</tr>
<tr>
<td>(2)</td>
<td>Class presentation by student(s)</td>
<td>Students are selected to act as an aid to the teacher, to press the next button at the signal of the teacher.</td>
</tr>
<tr>
<td>(3)</td>
<td>As motivational tool</td>
<td>The teacher uses the computer to show something interesting and motivating so as to arouse students’ interest.</td>
</tr>
<tr>
<td>(4)</td>
<td>As explanation Aids</td>
<td>The teacher may use the traditional teaching methods. But at a suitable time with a suitable software package, or video clips, or graphics,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>animation, etc., the teacher can use the computer to perform a demonstration to clarify the concepts; show phenomena; explain a theory; or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to motivate students’ interest.</td>
</tr>
<tr>
<td>(5)</td>
<td>Educational TV</td>
<td>Use Video on Demand or VCD to show ETV on a computer and displayed on a large screen, just as a computerised version of ETV.</td>
</tr>
<tr>
<td>(6)</td>
<td>To create learning situations</td>
<td>The teachers use computer to display a graphics, video, animation or film for classroom discussion, essay or report writing</td>
</tr>
<tr>
<td>(7)</td>
<td>As remedial teaching</td>
<td>For students weak in certain areas, if there is suitable software available, teachers can ask students to brush up their foundation by working on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the computer.</td>
</tr>
<tr>
<td>(8)</td>
<td>As reward</td>
<td>When students finish their assigned tasks early, they are encouraged to use computers to learn more either by using a computer program or searching the Internet for more information.</td>
</tr>
</tbody>
</table>

Page: 91
Table 3.4
Repertoire of strategies for incorporating IT in teaching (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>Strategy</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Rotating Group Work</td>
<td>A very common strategy in the activity approach and useful when resources are limited. The whole class is divided into several small groups and the whole lesson is divided into activities. Each group is occupied with one activity for a certain period of time and rotates to other activities as assigned by the teacher. The computer is only one of the settings. Thus only one computer is required.</td>
</tr>
<tr>
<td>10</td>
<td>Small groups of guided learning</td>
<td>As reinforcement, drill and practice or class activities, students are divided into small groups of 4 to 6, each group with a notebook computer. Students can discuss and work on the computer simultaneously in a collaborative way. It is different from (9) in that in the previous one all groups are working on different tasks and only one group of students are using the computer at any one time while in this strategy all groups are using computers.</td>
</tr>
<tr>
<td>11</td>
<td>Working in computer Room</td>
<td>It is similar to (10) in that all students are using computers. It is more on drill and practice, hands-on, or discovery type of activities where students can work independently and freely.</td>
</tr>
<tr>
<td>12</td>
<td>Project development</td>
<td>Students use the Internet, computers and related technology to develop their own project independently</td>
</tr>
<tr>
<td>13</td>
<td>Project Presentation</td>
<td>Students use computers and data projector to present their projects</td>
</tr>
<tr>
<td>14</td>
<td>As information provider and tool</td>
<td>If the information searching session is done by students in a normal class, the strategy belongs to (9), (10) or (12). If students are asked to do their homework or assignments after school, it becomes this strategy.</td>
</tr>
<tr>
<td>15</td>
<td>Collaborative knowledge building</td>
<td>When every computer is networked together, students can collaboratively engage in knowledge building through discourse communication - discussion forum, shared projects, joint problem solving, etc.</td>
</tr>
</tbody>
</table>

3.4.3.4 DATA ANALYSIS TECHNIQUES

Several statistical methods were used for analysis of the three questionnaire surveys and the weekly timetable reports. Both instruments were a rich source of data and thus were analysed using descriptive and comparative statistics.
3.4.3.4.1 Descriptive statistics

Descriptive statistics were first used on the three questionnaire surveys to find a general profile of the teachers through summing and categorising variables such as gender, age, qualifications, IT training experiences, IT knowledge, skills and experience, frequency of use of computers, years of teaching experience, subjects taught, perceptions of own IT skills, self-efficacy, and other items. The maxima, minima, means, percentages, standard deviations of each category were also displayed.

3.4.3.4.2 Repeated-measures ANOVA of General Linear Model

In order to inform the changes in teachers’ perceptions of their own IT skills, the changes in teachers’ self-efficacy in using IT in teaching, and teachers’ use of IT in teaching, three sets of data for each aspect were collected over the three periods, namely the first before the study in the first year, the second at the end of the first year, and the third at the end of the second year of the study, so as to find out whether there were any changes throughout the study. The null hypothesis that there were no significant differences between these three sets of data was assumed and tested to detect whether the null hypothesis should be rejected by means of the Repeated-Measures analysis of Variance of the General Linear Model (GLM).

3.4.3.4.3 T-test of pairwise comparison

If the null hypothesis was false and had to be rejected, it means there were significant changes between these three sets of data. Pairwise comparisons of the differences using t-test at $p <.05$ level was performed to detect significant differences between the frequencies for the three periods, and find out the periods where the changes are significant.

To further inform teachers’ use of IT in teaching, the numbers of strategies, periods, and weeks incorporating IT in teaching, were collected over two years of different numbers of weeks in each year. The data collected in the first and second year were grouped separately, and a t-test was performed to find whether there were any significant changes in the difference of means.
3.4.3.4 Effect size calculation

The GLM Repeated-Measure and the t-test involve the determination of the significance of the changes. However, they don’t provide an understanding of the magnitude of the effect (Bobko, Roth & Bobko, 2001). To alleviate the major criticisms of statistical significance testing, effect size calculation was performed on the quantitative data because the “fundamental concept underlying statistical significance testing is sampling variations” (Fan, 2001, p. 275). There are two ways of calculating effect size. Glass’s Delta (Glass, McGraw & Smith, 1981) divides the mean difference by the standard deviation of the control group, and Cohen’s (1969) d involves a standard deviation estimate that is “pooled” across both the intervention and the control groups (Thompson, 2001, 2002). SPSS provides the calculation of effect size, $\eta^2$ (eta square). Cohen’s general suggestions were used for interpreting effect size: The standardised difference of 1.21 is small, 1.51 is medium and 1.81 is large. As this study is qualitative in nature, there is no control group. The data were obtained by repeated measures of the same group. Thus Cohen’s d was considered more appropriate. Taking into account the limitations of the sizes of the two samples which may have had an effect on the significance level, the set of formulae published by Cortina and Nouri (2000) was used to calculate the Pooled Standard Deviation and effect size as shown below (p. 5):

The Pooled SD $s_p = \sqrt{\left(\frac{(N_1 - 1) \times s_1^2 + (N_2 - 1) \times s_2^2}{(N_1 + N_2 - 2)}\right)}$

The Effect Size $d = (Mean_2 - Mean_1) / s_p$

Thus, in the analysis of quantitative data, in GLM Repeated-Measure calculations, eta square provided by SPSS was used. In t-test of pairwise comparison, Cohen’s d was calculated using the formulae provided by Cortina and Nouri (2000).

3.4.4 INTERVENTION

There were two main components of the intervention. The first one was the training of IT knowledge, techniques and skills. The second one was trial teaching through Participatory Action Research (PAR) activities.
3.4.4.1 TRAINING

To fulfil the requirement stipulated by the Education and Manpower Bureau in the Information technology for learning in a new era - Five-year strategy: 1998/99 to 2002/03 that teachers have to attain the required IT competence levels, teachers were eager to take part in the IT training sessions. This was a school-based, on-site, ongoing training program that was planned by the IT Coordinator and IT Team members, with advice and assistance from the researcher. The IT Coordinator was a teacher who had good IT knowledge and skills, and was capable of taking charge of the IT development of the school. The IT Team members are younger teachers who were knowledgeable, competent and confident in using the software and hardware. The training sessions were coordinated by the IT coordinator and taught by peers – the IT Team members. The contents of the training sessions are shown in Table F.1 in Appendix F. There were 18 sessions from 2 February to 11 May 2001. There were hands-on activities after the teaching so that teachers could work on the assignments that formed the portfolio of the teacher. The requirements for different IT competence levels are shown in appendices K, L and M.

3.4.4.2 TRIAL TEACHING AND PAR

The second component of the intervention was trial teaching and participatory action research activities that lasted two years from 2000 to 2002.

3.4.4.2.1 Trial teaching

In trial teaching incorporating IT, teachers set the goals for using strategies incorporating IT in their teaching and tried them out. They were required to record their ways of incorporating IT in their teaching and their reflections as detailed in Timetable subsection of Section 3.4.3.3. The researcher, the principal and some interested teachers observed their classes and gave them feedback.

3.4.4.2.2 Participatory Action Research (PAR)

Action research attempts to make educational decisions more consciously and rigorously by employing appropriate designs and techniques for exploring and documenting them (Kemmis & McTaggart, 1988; McKernan, 1996; McTaggart, 1997). In this study, PAR incorporates normal ideas about action
research being a process in which a teacher sets out to explicitly study something in order to change and improve it. The process is conscious and encompasses systematic data collection. It is participatory in that it is undertaken by both individuals and a collective of individuals, the school, in order to take an imaginative leap from a world of ‘as it is’ to a glimpse of a world ‘as it could be’ (Kenny, 1994). Hence, it is public and collaborative and provides opportunities for teachers to identify problems, plan and implement strategies, reflect on the effects, and suggest solutions or alternatives through processes of cyclic implementation and review. Furthermore, through engaging as a community of practice opportunities exist for teachers and the researcher to experience success and engage in vicarious learning elements essential to the development of self-efficacy (Bandura, 1977b). In this practice, the researcher assumed the role of critical friend and hence was a participant observer.

3.4.4.2.3 Composition of PAR

The operationalisation of the PAR approach required the establishment of PAR groups. Each group normally comprised of five teachers teaching the same subject, like English, Chinese Mathematics, General Studies, and so on, with one member belonging to the IT Team.

3.4.4.2.4 Leaders of PAR group

The member of the PAR group who was a member of the IT Team was assigned the leaders of that PAR group. They had more knowledge and better skills in using IT than their colleagues in the group. As mentioned in Section 3.4.4.1, some of the leaders were also tutors of the training sessions. They were usually assigned to a group of subject that they taught, or which had some relevancy to the leader, like David, for example, who was assigned the Art group because he learned Chinese painting, although he taught English, Mathematics, Computer Studies, and General Studies.
3.4.4.2.5 The framework of the PAR structure

![Diagram of PAR structure]

Figure 3.1 The four levels of action in the professional development model of the study.

The “grassroots model” (Bleicher et al., 1996) as described in Section 2.9.2) provided a framework for structuring the groups and relationships among groups. Each PAR group was facilitated by the leader of the group who in turn worked with the IT coordinator. The IT Coordinator communicated directly with the researcher, as shown in Figure 3.1.

3.4.4.3 STAGES OF THE INTERVENTION

The intervention of the professional development initiative was implemented in four stages. They are outlined briefly as follows.

3.4.4.3.1 Stage I: Building rapport and situational analysis

It was necessary to gain the confidence of and build rapport with the participants in order to motivate them to pursue their own goals. It was also necessary to collect data for a situational analysis as the benchmark of the initial status of the staff and school before the main-study intervention. Hence the first stage of the intervention involved rapport building and a situational analysis.

The researcher met the principal and teachers of the whole school on a special session in a Friday afternoon. Immediately after the researcher was introduced to the teachers by the principal, teachers and the principal were requested to fill in the CITITEBI questionnaire survey (Section 3.4.3.3) so that demographic data and initial states of teachers’ beliefs were recorded. These formed the basis for comparison of results obtained in later states.
After the survey, the researcher briefly introduced his vision for using IT in teaching and learning and his mission to help teachers teach and students learn more effectively. He then analysed the current situation for the school using IT in Hong Kong, the conditions of using IT in teaching, the problems faced by the school and teachers, and some possible solutions. The researcher then described the content of the professional development initiative and gave a seminar which was designed to introduce the principles and assumptions of participatory action research, composition of PAR groups, activities in each PAR meeting, and the line of reporting. He then sought the commitment of the teachers and the school to engage in the study. After the seminar and the discussion that followed, the ameliorating concerns, consent, commitment and cooperation of the teachers and the school were obtained.

3.4.4.3.2 Stage II: Provision of pre-requisite knowledge

The situational analysis revealed key issues that concerned the teachers. To address these issues the second stage consisted of two workshops conducted by the researcher. They were aimed at giving the teachers the required knowledge, skills and orientation for the embedding of IT. The first workshop was on the development and modification of interactive multimedia computer-based teaching materials using Microsoft PowerPoint®. The purpose of this workshop was to enhance teachers’ confidence in using IT in teaching, and to provide them with a safe start. There were hands-on activities with which teachers learnt the techniques in developing simple multimedia teaching materials. The second workshop iterated the researcher’s intention to help teachers to master the integration of IT in teaching. The role of the researcher and the requirements of the teachers were explained. PAR was revisited and the formation of PAR groups was suggested. A repertoire of 16 strategies incorporating IT in teaching was introduced and the ways these strategies were used were also explained so that teachers knew when and how these strategies could be implemented in their lessons. After the second workshop, teachers formed their PAR groups themselves without the intervention of the researcher.
3.4.3.3 Stage III: Training and PAR sessions

The third stage of the intervention consisted of two main components as mentioned in Section 3.4.4 above. The first component was a series of training sessions. The training sessions were planned by the IT coordinator and members IT Team (school-based) and conducted in the computer room, MMLC and classrooms of the school (on-site). The training sessions lasted four months (ongoing) and were taught by the members of the IT Team. They prepared their own teaching materials and devised hands-on activities so that, by undertaking these activities, teachers could accomplish the tasks listed in the IT competence levels.

The second component was the trial teaching and PAR activities. The first trial teaching and PAR weekly meetings started in October 2000 and lasted for 27 weeks with two non-teaching weeks, to provide participants with performance experience and boost self-efficacy and confidence. Teachers were required to document their activities on the weekly timetables and submitted them to the researcher through the IT Coordinator. The researcher then compiled descriptive statistics on teachers’ use of IT strategies in their classroom teaching. The IT coordinator was informed of the results so that he could encourage more teachers to use, and improve their use of IT in teaching.

Each Wednesday afternoon, students were dismissed earlier so that a free period was allocated for the Teaching and Researching. It was a period for briefing and discussing current issues in the school. After the implementation of the PAR, this period was used as a group meeting time. Teachers of the same PAR group met and shared their experience with other members. The leader of the group would try to identify the problems they came across, the solutions they used, and the reflections they had.

On Friday afternoon, students were dismissed early again so that teachers of the whole school could gather together. The researcher, the teacher and the principal worked together on questions raised and problems came across by teachers during the trial teaching. Teachers requested suggestions from the researcher for improving their teaching using IT. After the meeting, teachers set their own targets of using IT in their teaching again and tried it during the
next week.

Near the end of this stage, teachers’ frequencies and patterns of using CIT strategies in teaching were established from the timetable reports and their beliefs were discovered from the survey, target teachers were identified. Case studies and classroom observations were performed as a means of collecting first hand qualitative data. The focus was on a few particular teachers and centred on individual teacher’s perceptions of their abilities to incorporate IT in their classroom teaching. These data were used for triangulation with the data obtained from the questionnaire surveys and the timetables in the weekly PAR meetings.

At the end of this stage, a questionnaire survey using CITITEBI was performed again to elicit the states of teachers’ beliefs after the training sessions, trial teaching and PAR activities.

3.4.4.3.4 Stage IV: Autonomous stage.

After the first year of intervention, the researcher withdrew from close involvement in the PAR to let the IT Coordinator continue to organise the weekly PAR activities. This was done so that teachers could develop their own initiatives and claim ownership of their own professional development as an important step in developing sustainability and autonomy. Teachers were requested to keep records of what strategies they used incorporating IT in their teaching, and the problems or obstacles and solutions by recording them on the timetable. They are required to meet and share every week under the guidance of the leader of the group and the IT Coordinator. They are also required to send their timetables to the researcher through the IT Coordinator weekly. The researcher compiled the statistical reports and sent them to the IT Coordinator as in the first year. The IT Coordinator took the researcher’s role and promoted the good practices through sharing and information sessions with the teachers. The PAR activities lasted 37 weeks with two non-teaching weeks.

As teachers had attained the required level of IT competence, the needs of training sessions was not urgent among teachers. Only two training sessions were organised for teachers by a member of the IT Team.

After approximately eight months, the researcher came back to the school
to conduct a third situational analysis by interviewing particular teachers, conducting classroom observations and administering a questionnaire survey using CITITEBI, in order to examine the sustainability of the levels of perceptions of teachers’ own IT skills and self-efficacy.

### 3.4.4.4 TIME-LINE OF THE FOUR STAGES

To provide a figurative and comprehensive description, the whole design can be depicted as shown in Figure 3.2.

<table>
<thead>
<tr>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapport</td>
<td>Prerequisite knowledge</td>
<td>Training &amp; PAR</td>
<td>Autonomous</td>
</tr>
<tr>
<td>PAR intro</td>
<td>PPT IT in teaching</td>
<td>School-based training</td>
<td>Training</td>
</tr>
<tr>
<td>Survey</td>
<td>PAR meetings</td>
<td>PAR meetings</td>
<td>PAR meetings</td>
</tr>
<tr>
<td>Survey</td>
<td>Timetable report</td>
<td>Timetable report</td>
<td>Timetable report</td>
</tr>
<tr>
<td>Interviews</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 3.2 Four stages of the research design.*

### 3.4.5 AUDIT TRAIL

Good qualitative research requires detailed record keeping and indicates ways that data are connected. According to the American Accounting Association, audit is defined as “a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between these assertions and established criteria and communicating the results to interested users” (p. 2). For a qualitative study, the audit trail applies by simply replacing the word “economic” by “educational”. According to auditing theory, attributes of audit evidence must be relevant, reliable, sufficient, representative and timely. Similarly, in this study, the data collected should be relevant to the study for the effectiveness of the intervention. The data should also be reliable and trustworthy. There should also be sufficient data that would provide
triangulation from different perspectives and parties like teachers, peers, students and principals. By categorising collected data, evidence reasonably representative of the whole population would be sorted out, if it exists.

From Schwandt and Halpern (1988), raw data, reduced data, reconstructed data, represent phenomena while process notes, notes about intentions and motivations, and instruments, tools and resources represent inquiry procedures. The unfiltered and filtered accounts, summaries of raw data, theoretical notes, relationships among categories, findings and conclusions, reports, methodological notes, were the various forms of data to be kept and observed. Data obtained in the survey, timetable collections, PAR meetings, teachers’ field notes, interview and classroom observation data, were all monitored by the audit trail practice. The sufficiency and relevancy of recorded data were ensured.

3.5 LIMITATIONS AND ISSUES

As the study was performed in a single school with only 40 teachers, and the instruments were questionnaire surveys, self reports, interviews, observations and artefacts such as teachers’ portfolios and the work they did, there were limitations and issues which should be addressed to ensure the results were meaningful, valid and reliable. Hence, validity and reliability had to be considered carefully.

3.5.1 VALIDITY AND RELIABILITY

To ensure the conclusions are trustworthy and useful, validity and reliability issues have to be considered. Following Sproull’s advice (1995), for internal validity, the following concerns were considered and addressed:

- How context-rich and meaningful are the descriptions?
- Is the account rendered a comprehensive one, respecting the configuration and temporal arrangement of elements in the local context?
- Did triangulation among complementary methods and data sources produce generally converging conclusions?
- Are the presented data well linked to the categories of prior or emerging theory?
- Are the findings internally coherent; are concepts systematically related?
• Are areas of uncertainty identified?
• Was negative evidence sought and found?
• Have rival explanations been actively considered?

For external validity, the following questions are considered:

• Does the finding include enough “thick description” for readers to assess the potential transferability, or appropriateness for their own setting?
• Does a range of readers report the findings to be consistent with their own experience?
• Are the findings congruent with, connected to, or confirmatory of prior theory?

For reliability, the following questions will be considered:

• Are the research questions clear, and are the features of the study design congruent with them?
• Is the researcher’s role and status within the site explicitly described?
• Do findings show meaningful parallelism across data sources?
• Are data collected across a full range of appropriate settings, times, and respondents, suggested by the research questions? (pp. 278-279)

These issues will be considered when collecting, analysing and interpreting data in the study to ensure the conclusions are reliable and valid.

3.6 RESEARCH ETHICS

To avoid violating ethical practices, the following procedures suggested by Sproull (1995) were also observed, and appropriate ethics clearance was provided by the University Ethics Committee:

• Obtain free consent and informed consent from the participants: They were supplied with sufficient information about the research and they were not pressured in any way to participate in the study;
• Assuring and maintaining confidentiality, privacy and anonymity: All correspondence was confidential; the participants were not identified and their privacy was fully respected;
• Appropriate methodology to ensure the research is conducted systematically and objectively;
3.7 CONCLUSION

The study was viewed as grounding for improving practice in the classroom (Richardson, 1994). This formal research program would help us understand the ways in which teachers interact with technology and how they could be supported to implement effective applications of technology in their teaching. Questionnaire surveys provided each and every teacher’s individual changes in demographic data as well as their frequency of use of computers, perceptions of their own IT skills, self-efficacy, and school facilities. Timetable reports provided information about teachers’ practice in using IT in their teaching of different subjects at different levels, with documentation on problems and obstacles. Quantitative methods provided tests of statistical significance and magnitude of effect. Qualitative methods cases enabled the study of individual teachers in rich detail and thick and meaningful description as a comprehensive complement to the numbers derived from the quantitative methods. Through questionnaire surveys, timetable reports, interviews, classroom observation, teachers’ portfolio and other artefacts, the findings were triangulated to ensure validity. The research questions were specific, and the research design centred on these research questions so as to give reliable results which were comparable with those informed by other research. If shared with teachers, this knowledge informs them about their current teaching practice and establishes a relationship which allows them to improve practice through participatory action research (Carr & Kemmis, 1986). Implementing practices that challenge our existing beliefs about teaching can be difficult. Unless there is convincing evidence that new approaches to teaching are effective they appear as new fads to be implemented by decree. Technology could be seen in this light. However, good teachers are reflective practitioners prepared to explore change and engage in transformation of their teaching. Change is notoriously difficult to achieve and depends on both institutional support and personal volition (Fullan, 1993). Initiating and sustaining change is personally threatening to both the individual and the organisation. Together, through strategies such as collaborative action research organisational change is possible (Hendry, 1996). Teachers individually need to evaluate how they can
change their practice to help students learn effectively.

Informed by literature and drawn from experiences of researchers, the design of the current study observed the issues and concerns of different research strategies and chose the mixed method design, which was believed to be able to provide reliable and meaningful results.
CHAPTER 4 RESULTS OF CONTEXTUAL ANALYSIS

4.1 CHAPTER OVERVIEW

As described in Section 1.7, this study aims at finding out an effective staff development model that can make an impact on teachers’ incorporation of IT in their teaching. It is necessary to conduct a situational analysis of current practices in the use of computers and IT in a school in Hong Kong. Government and school documents and the literature suggested that there are both barriers and incentives in promoting IT in teaching in Hong Kong, as described in Section 2.7: Context of Education in Hong Kong. In this chapter, the barriers and incentives in promoting IT in teaching in the school were identified from the data collected during the intervention. The chapter commences with information about the school (Section 4.2) followed by a description of barriers (Section 4.3) and then incentives (Section 4.4) are described. The chapter concludes with an assessment of the interaction between barriers and incentives.

4.2 INFORMATION ABOUT THE SCHOOL

In order to evaluate the effects of the study, it is necessary to know more about the school in which the study was conducted, the constraints, the background of the students, the concerns of the principal and the teachers. In exploring these issues it is acknowledged that schools reflect the cultural, political, social and economic circumstances of their community and the society at large. Tensions exist between social responsibility and personal beliefs of the teachers and administrators and hence schools change reforms as much as reforms change schools (Cuban, 1999). The following gives a concise account of these issues.

4.2.1 THE SCHOOL VISION

The school is called “The Philanthropy Primary School” (pseudonym). It is a primary school run by a Christian Church. The school vision can be found on the school website (2001),

The graduates of the school will have healthy attitudes to life, proper evaluation, be brave in shouldering responsibilities, willing to serve God and ready to serve the communities. They have perfect virtuous,
intellectual, physical, communal, esthetical, and spiritual development (School Website, translated from Chinese original by the researcher). URL: http://hs.hkcampus.net/index1.html (Part of the website is covered to ensure privacy and anonymity)

Thus Philanthropy Primary School aims to educate all-round students rather than emphasise academic subjects. All teachers are encouraged to use IT in teaching, although certain weeks are especially reserved for teachers using IT in teaching Chinese language, English language and mathematics.

4.2.2 THE SCHOOL’S FIVE-YEAR STRATEGIC PLAN (2001 – 2005)

The school has a five year plan as listed in the school website (2001):

- Strengthen the work of guidance and counselling; enhance the sense of responsibility of the students.
- Actively carry out information technology education
- Conduct school-based curriculum reform; promote creative teaching

(School Website, translated from Chinese original by the author).

4.2.3 GENERAL INFORMATION

This is a whole day school. There are nine periods per day and five days per week of school. The timetable is similar to other whole day schools (cf. Appendix D).

There were about 800 students (400 male; 400 female) in 2000-01 and 2001-02

There were four classes for each year except Primary Four which had five classes in 2000-01 and were promoted to Primary Five in 2001-02, and three Remedial Classes (RC), making a total of 28 classes in the school per year in the two years of the study.

There were 40 teachers in both 2000-2001 and 2001-2002. As mentioned in Section 3.4.2, there was mobility among the teachers, only 31 teachers who taught in both years and who responded to the questionnaires without missing items were selected. The findings are restricted to these teachers in the following discussions. There were 21 female teachers and 10 male teachers in the study. From Table 4.1, the age distribution was bimodal, with 11 young teachers from 21 to 30 in the first two surveys, and ten in the third survey. The
number of teachers over 50 years of age increased from 7 in the first survey, to 9 in the second survey, and 12 in the last survey.

It is seen from Table 4.2 that most teachers had finished one to two years of teacher training, but many of them were studying for degree courses in tertiary institutions and universities. The number of teachers graduating from tertiary institutions and universities increased slowly from 9 in the first survey to 13 in the second survey and 14 in the last survey. The results indicate that many teachers were working and studying at the same time. They were intent on improving their professional qualifications.

Table 4.1

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-25</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>26-30</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>41-50</td>
<td>9</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Over 50</td>
<td>7</td>
<td>9</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 4.2

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Certificate</td>
<td>21</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Tertiary</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Degree</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Masters</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Teachers’ mean workload was 29 periods per week and the standard deviation was 3.65. About 68% of teachers have a workload of 25 to 33 periods a week.

4.3 BARRIERS IN INCORPORATING IT IN TEACHING

Many barriers, which hindered the incorporation of IT in teaching, were observed in the study during the two school years, from 2000 to 2002 at Philanthropy Primary School. These barriers were infrastructural, resource related, and cultural. Infrastructural barriers included those due to the school building. Resource related barriers included the quantity of computers and peripherals (hardware), software and teaching materials, and the quality of the
network and teaching platform. The cultural barriers were the Hong Kong education system, education reforms and Chinese keyboard input methods. The effects of these barriers on the incorporation of IT in teaching will be summarised below.

4.3.1 INFRASTRUCTURAL BARRIERS

The school building presented teachers wishing to implement IT in teaching with considerable barriers. The limited space available in the school building created problems in accommodating computers and peripherals, network servers, and trunks for cables. Lack of space in classrooms also severely constrained effective use of IT by students and teachers.

4.3.1.1 THE SCHOOL BUILDING

Philanthropy Primary School was built in 1970 using the plan of a single block “matchbox type” estate primary school designed in the 60s (Figure 4.1), as described by Chung and Ngan (2002). The building conformed to an old design which aimed to be cost-saving and used just enough structural pillars to
support the school. There are four special rooms for music, art and craft, library, medical care, and the school office, all allocated on both sides of the long second floor corridor (Figure 4.4). There are six classrooms on both sides of the corridor on the next four floors (Figures 4.5 and 4.6). The computer room, server room, and Multimedia Language Centre (MMLC) were not provided for in the original design. The school area is less than half of the contemporary Millennium Schools. Due to its original cost-saving design, it is also impossible to put another storey on top of the current building to make more rooms. So the design and construction of the school building formed a very severe barrier in incorporating IT in teaching and learning.

4.3.1.2 SPACE FOR COMPUTERS

Due to the limited space and number of rooms, Philanthropy Primary School had to relocate the library and the medical care room to two small rooms on the ground floor to provide space for the computer room. The Art and Craft room was partitioned to make space for the MMLC, leaving a very small area for Art and Craft (Figures 4.4 and 4.7). About one-third of the staff room was partitioned by tall cabinets to form the staff computer room (Figure 4.8). A small room in the general office was converted into the server room. Limited by the useable space, the computer room can only accommodate twenty student computers and one teacher computer. The MMLC is bigger and can accommodate 40 student computers and one teacher computer.

Figure 4.4 Floor plan of the second floor
4.3.1.3 SPACE FOR STUDENTS

As informed by literature reviewed in Chapter Two: The Context, the small classrooms of Philanthropy Primary School were built for the exam-oriented, elite approach in primary education in the 1970s. The small size of 7.7 m by 6.82 m = 53 sq. m. (Figure 4.3) accommodating an average of 40 students makes the classroom very crowded (Figure 4.9). A teacher’s desk and chair in the front of the classroom has already occupied a lot of space, hence, there is little available space to install more computers for students’ self-directed usage in the already very crowded classroom. The computer display data projector has to be ceiling mounted; otherwise it would take a long time to move the desks to accommodate it. A student’s desk, which is 60 cm by 40 cm, is too small to accommodate even notebook computers comfortably. Students’ seats in each classroom are arranged rigidly in fixed columns and rows with very little space between them, making arranging students in groups very difficult (Figure 4.9). The limited space makes the physical organisation of the bigger senior primary students into groups even more difficult, thus severely limiting some pedagogical approaches like working in small groups on computers.

4.3.1.4 SPACE FOR TEACHERS

After the staff computer room was partitioned from the staff room of Philanthropy Primary School, approximately 68 sq. m. remained to accommodate over 40 teachers. Each teacher can only enjoy a space of 1 m. by 0.9 m. which has to hold stacks of exercise books, teaching materials and
teaching aids, and textbooks (Figures 4.10 and 4.11). The space is so small that even using a notebook computer becomes difficult. The space and facilities do not encourage teachers to incorporate IT in teaching.

Figure 4.6 Corridor in the school building

Figure 4.8 Small staff computer room

Figure 4.9 Small classroom accommodating 40 students

Figure 4.10 Very little space for teachers

Figure 4.11 Overcrowded staff room

4.3.2 LIMITED RESOURCES

Philanthropy Primary School receives subsidy funding from the Government and hence is an aided school. As finances are tightly controlled by the government, purchasing priorities are often difficult to negotiate.
Purchasing computer hardware and software are not high priorities. Space limitations restrict the storage of resources. Many of the resources are stored in shelves and cabinets on the sides of the staff room (Figure 4.11).

4.3.2.1 COMPUTERS AND PERIPHERALS

For teachers: Due to the limited space at the back of the staff room, only four computers, four printers and two scanners can be accommodated (Figure 4.12). One computer is reserved for the School Administrative and Management System (SAMS). Teachers voiced concern that, for a school of 40 teachers, three computers are not enough. Teachers often queue up during recess to use the computer. But they understand the limitations of the school, and many of them simply work on their own computer at home. However, teachers often have difficulty bringing the multimedia teaching materials to school because the file size of a multimedia teaching material is usually several times the capacity of a floppy disk. Not many of the teachers had a CD writer or a Zip drive at home.

For Students: There are 41 computers in the MMLC and 21 computers in the computer room. No additional rooms and space are available for more student computers or peripherals. Teachers David and Flora revealed that there were many different activities involving students in using computers and the Internet during recess and after school. The MMLC and the computer room were fully packed and would not be suitable for allowing students to use these computers to work on their assignments.
4.3.2.2 STUDENTS’ HOME COMPUTER AND SOFTWARE

During the interviews, teachers David (Section 7.7.2.2) and Flora (Section 8.7.2.2) pointed out that the families of many students are of low economic status who cannot afford a home computer. David said that even for those with a home computer (Section 7.7.2.2), they might not be able to afford the high cost of the Microsoft Office package. Though students can go to community centres where there are computers, the queues are usually very long. They said that asking students to do their homework with computers was very difficult.

After the study, Philanthropy Primary School recognised the problem that many students did not have a computer at home, which would be a great barrier to further promotion of the use of IT in learning in the new school year. Therefore the school organised a group purchase scheme of computer hardware and the Chinese Windows XP package for students in the first week of the 2003-04 school year. Probably because not many parents could afford the cost, the response was not encouraging. Only a dozen or more parents joined the scheme. The school intends to conduct a survey of student home computers in due course.

4.3.2.3 SOFTWARE AVAILABILITY

Though Ken stated that there were many software items for teachers to use in teaching, Flora and David pointed out that, besides the Microsoft PowerPoint® files developed by teachers or downloaded from educational websites, (e.g. Information Technology in Education Network, the Education City, school websites, and some Taiwanese educational websites), teachers can use only Education TV CD-ROMs and IT-based teaching materials from the publishers. Ross, the IT Coordinator, said that the school did not have much funding for buying educational software packages, or buying and installing a CD-ROM tower for sharing out the CD-ROMs. So teachers have to bring the CD-ROM physically into the room and place it in the drive. When a CD-ROM is used by one teacher, other teachers and students cannot get access to it until the teacher returns it to the shelf, thus limiting the applications of software in teaching by the teachers.
4.3.2.4 NETWORK PERFORMANCE

Although the network was wired from the server to the MMLC, computer room, staff computer room and four classrooms, Flora, David, Susan and other teachers reported that the computers in the classrooms could not be used for accessing the Internet, making it very difficult for teachers to bring the outside world into the classroom.

Flora complained that her students’ often lost their work because their files were deleted by other people with access to the network. David explained that the network provided only group accounts with no capacity limits. Thus one student could store a lot of graphics and other files which occupied nearly all the space, and other students were unable to save files. There were also no security measures, so students could log in and erase other students’ work, yet there was no way to trace the offenders. Ross commented that giving students accounts and passwords would be another nightmare because many students cannot remember these personal details, and it would cause more problems for teachers in the classroom than solving the current one.

4.3.2.5 NATURE OF COMPUTER SYSTEMS

Although all teachers at Philanthropy Primary School learnt about computers organised by the sponsoring body running the school before the intervention, many of them did not use computers seriously (Table 5.1, Section 5.2.1). With the peer-tutoring training sessions incorporating hands-on practices, teachers became more competent when using the computers at school. However, teachers at Philanthropy Primary School often experienced difficulties in developing resources. For example, Flora related her difficulties in sharing documents with graphics and figures embedded in the files when she opened them in different versions of Microsoft Windows. Flora had worked with another teacher to produce an electronic book. It was decided that each one would work on their half of the whole book. When they finished, Flora found that the pictures, graphics and figures all shifted, and it took her too long to fix them. Eventually she did all of the other half by herself instead of fixing the bugs. Events such as these were frustrating and presented a barrier to further use of the technology.
Teachers also reported other critical events that were constraining uptake. For example, in the development of Microsoft PowerPoint® presentation files, teachers were puzzled that the sound effects worked when the presentation was run for the first time. However, when the control looped back and ran the slide again, the sound clip was not activated. Some teachers asked for solutions after they attended the Microsoft PowerPoint® Development seminar by the researcher. It was discomforting to the teachers because software engineers were not aware of how teachers used the software.

Finally the use of various software packages often requires specialist knowledge and problem solving skills. For example, after the researcher installed the Norton Antivirus software on school equipment, he found that he could not clear the rubbish bin to claim more space as he normally could. As an expert, he could quickly resolve the problem but when these problems happened in the classroom, teachers felt embarrassed and their sense of authority eroded. Thus teachers would either resist or be indifferent to the use of IT in teaching especially where it involved new applications. Teachers’ views agreed with those observed by Cuban (1986). They believe that using IT would increase their burden and weaken their control of the classroom even though they may also believe that there are benefits to their students’ learning. So the computer system itself, including properly running hardware and fully backward-compatible software, can become a barrier to teachers’ use in teaching, as voiced by some teachers during the study.

4.3.2.6 VANDALISM AND DISCIPLINE IN CLASS

Vandalism by students happened at Philanthropy Primary School. For example, some writing tablets were damaged, mouse balls removed, microphones and earphones torn apart, and software deleted. When one teacher designed some activities, some program files were missing which rendered the program inoperative. Missing mouse balls prevented students from effective control of the program, and damaged tablets hindered students’ ability to respond in Chinese. Torn microphones and earphones caused problems in running an interactive multimedia program. The school could not justify purchasing more sets to replace those vandalised, and so when they broke down,
they were not replaced. It could take weeks or even months to have the items replaced, which in effect reduced the number of computers available for use, caused class management problems, and had impact on the school budget.

Since there was only one classroom on each floor that had a projector, when teachers wanted to use computers in the classrooms, they had to request the teacher in the classroom with computer and projector to swap classrooms, which caused trouble for the other classes. Some teachers indicated that they would not swap classrooms because they did not want to give other teachers trouble. Teachers also expressed discontent when they wanted to take students to the MMLC. It was not easy to book, and they had to march students up and down the floors which took quite some time off the already very tight teaching schedule. The noise from the computers in the computer room and MMLC and the websites and programs became a distraction to teaching. Hence, teachers and students did not have a comfortable and safe environment to work on their teaching and learning.

4.3.3 CULTURAL BARRIERS

As noted in Chapter Two, Hong Kong was a Confucian-Heritage Culture (CHC) under British rule. The two cultures influenced the Hong Kong education system. The education reforms started by the British Colonial government and continued by the Hong Kong Special Administration Region government have caused consternation among teachers. The following discussion will summarise this aspect of the contextual analysis.

4.3.3.1 THE HONG KONG EDUCATION SYSTEM

As was described in Section 2.7 the Hong Kong education system is subject-based, examination-oriented, norm-referenced, highly segregated, schedule-tight, and teacher-centred (Biggs & Watkins, 2001; Hargreaves & Lo, 2000; Ho, K.K., 1996; Ho, I.T., 2001; Lo, 2000; Watkins & Biggs, 2001). Philanthropy Primary School follows the practice of streamlining pupils into classes of different abilities. There are three examinations and three tests for Primary Six pupils, but only two examinations and four tests per year for Primary One to Four pupils.

It was mentioned in Section 2.1.3 that Dienes’ effect is common in Hong
Kong where textbooks are authored to ensure teaching is teacher-proof. Many of the textbooks and teacher’s manuals are authored by serving teachers or academics at the schools or faculties of education in universities. In recent years, the textbook publishers are more aware of the potential contribution of IT to teachers’ teaching and students’ learning, so they are willing to inject a large amount of capital on the development of IT-based teaching materials.

As other primary schools in Hong Kong, subject panels at Philanthropy chose textbooks from the limited number of publishers. The textbooks contain detailed plans for teaching the topics, with suggestions for pedagogy and activities. There are also a full set of teacher’s manuals and accompanying teaching materials. To help the readers not familiar with the Hong Kong teaching style, a teacher’s manual for Primary Two English language “On Target” by Ron Holt is used as an illustrative example.

The teacher’s manual (Holt, 2000) starts with an introduction in which two pages, each with two columns, where resources are listed and explained for students and teachers. Student’s resources include a student’s book, workbook and tasks, grammar practice books, bilingual cassettes and CDs, and CD-ROM. Teacher’s resources include teacher’s manuals, monolingual cassettes and CDs, workbook and tasks teacher’s edition, grammar practice books teacher’s edition, wall pictures, word and picture flash cards, work cards, overhead transparencies, teacher’s electronic resources, and assessment booklets and cassettes.

As the teacher’s manual contains the pedagogy and strategies, together with the required resources, subject panels usually simply divide the units according to the timetable so that certain units are taught in certain period of time. While teachers are time poor due to various teaching and non-teaching duties, most teachers simply follow faithfully the teacher’s manual and the schedule.

4.3.3.2 COMMON TEACHING PRACTICE

Teachers at Philanthropy followed the Chinese tradition of schooling. As described in Section 2.7.1.7, students at Philanthropy were taught to obey, respect and listen to teachers and follow their instruction and not to challenge
them. Strict discipline was expected. Students were not allowed to talk without teachers’ approval. They were expected to raise their hands and wait for permission from the teacher before they are allowed to answer the questions raised by the teacher.

Teachers at Philanthropy Primary School follow the usual practice of motivating the students in the beginning of the lesson. The content of the topic is first introduced. Drill and practice exercises are then done. For example, in learning Chinese characters in a Chinese lesson, the teacher write the character on the chalkboard, students then practice writing in the air and say the character together. The teacher might then ask individual students to write and say, and then a group or a row of students to repeat. The teacher then teaches students how to combine words with the character to form new words, and give them examples. Students are asked to form more new words. If time allows, the teacher might ask students to write on their classwork book with more words. The teacher might also give homework on the topic. Teachers’ practice at Philanthropy Primary School can be regarded as traditional, didactic and teacher-centred, but it can also be seen as a deep approach, with repetitive drill and practice for the skills and knowledge first, then creativity by asking students to join words together (Section 2.7.2).

4.3.3.3 SOCIAL STATUS OF FAMILIES OF STUDENTS

The school is located in an area with families of low social status. Education is a means of climbing up the social ladder because good results in primary school more or less guarantee successful students a good secondary school, which, in turn, promises them entry into higher education. Hence, the school and some parents take marks in tests and examinations very seriously. High performance in examinations is valued and schooling is viewed as a “social escalator” (Cuban, 1999). Parents expect teachers to cover the content in the textbook according to teaching schedule and time (Ho, I.T., 2001) so that their children can be equipped with the required knowledge for the examinations that will determine their future. “In the fiercely competitive game of norm-referenced testing, in preparing for secondary selection, parents are determined that no other child might get an edge on their own child” (Watkins & Biggs, 2001, p. 15) There is little encouragement or support for teachers to
try innovative teaching methods at the risk of not completing the prescribed teaching content.

4.3.3.4 EDUCATION REFORM

As noted in Section 2.7.4, many of the past education reforms were not completed successfully. The Education Department emphasised the countable facts rather than the uncountable qualitative and intangible benefits. Schools and teachers were under gigantic pressure to deal with the rapidly changing education policies and the avalanche and tsunami of teaching duties. They had learnt to deal with the authorities by giving numbers rather than qualities. In 2000-01, when all teachers and schools were involved in teaching with IT, teachers at Philanthropy Primary School were devoted and attended many seminars and workshops. Tertiary institutions and commercial companies fought for the introduction of these courses, and the courses were mainly on IT techniques rather than pedagogy because the four levels of IT competence were mainly on IT knowledge, techniques and skills (p. 11). Teachers wanted to learn and tutors wanted to teach, but their expectations did not match. Teachers who attended the advanced courses did not learn much (Ka: 20). In 2001-02, the “Learning to Learn” and the “Life-Wide Learning” were promoted and many seminars were held instead of IT seminars. Flora said that many teachers were expected to attend these seminars, and because of the limited time available they had to stop their trials in using IT in teaching. Wylde said that because teachers had to accept these new requests, they used less IT, and thus became less confident and less efficacious. Susan gave a vivid description of the new tasks as hammers that teachers had to catch because if they did not go, their school would be blacklisted and might not be able to get new Primary One students in the coming school years. As mentioned in Section 1.5.1, the birth rate in Hong Kong has been decreasing for the last several years and there has not been any sign of recovery. Many primary schools, some of them were of long history and with good reputation, closed because the EMB did not send Primary One students to these schools. It was not uncommon for some teachers to use IT just for the sake of fulfilling the request.
4.3.3.5 CHINESE INPUT METHODS

As mentioned in Section 2.7.6, inputting Chinese characters into the computer is a considerable barrier for students, which prevents teachers from asking students to word-process their projects or assignments. This section describes the preferences adopted by various teachers in the school and the frustrations that emerge in confronting this issue.

From Table 4.3, out of the 31 teachers, only seven reported using Changjei in the first two surveys, the number dropped to six in the last survey. There were 11 teachers using the Simple and Quick input method, and the number increased to 16 in the last survey. Four teachers reported using tablets before the study, and the number dropped to zero in the second and third survey. The implication here is that after training, teachers learned the Changjei and the Simple and Quick input methods, they abandoned the writing tablets and used the keyboard input methods. But since the Changjei is hard to learn and easy to forget (Section 2.7.6), more teachers used the simplified Simple and Quick method than the Changjei method.

In Table 4.4 it can be seen that one Chinese language teacher, Leva, reported using only the Changjei input method in all three surveys. Ross and Veronica reported using both Changjei and Simple and Quick in the first two surveys, and Changjei only in the last survey. Lida reported using Simple and Quick in the first survey, both Simple and Quick and Changjei in the second survey, and Changjei only in the last survey. Fanny reported using Simple and Quick in the first survey, and both Simple and Quick and Changjei in the second and third surveys. David and Wylde reported using Changjei in the first and second survey, but Simple and Quick only in the last survey.

Table 4.3

<table>
<thead>
<tr>
<th>Code</th>
<th>Method</th>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Did not use</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Guangdong</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Simple and Quick</td>
<td>11</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Changjei</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Quick Code</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Tablet</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Teachers may choose more than one input methods.
Tables 4.3 and 4.4 show the mastery of the Chinese input techniques. Some teachers did not use Chinese input methods and others may use tablets. Chinese teachers had to use some form of Chinese input because they had to process their test and examination papers. Teachers who are skillful enough might use Changjei alone, just like Leva. Others who were not so proficient might use Changjei most of the time, and switched to Simple and Quick when they get into trouble finding the right code. There is a large variation from mainly Changjei to mainly Simple and Quick. As mentioned previously and in Section 2.7.6, Changjei is easy to forget, expert users may fall back to Simple and Quick occasionally. Because of the complexity and memory demands of using Changjei, uses of this approach are considered as experts in Chinese word processing, whereas those who can only use Simple and Quick are deemed less skilled. Given this context, it can be seen (Table 4.4), that more teachers became proficient in Chinese word processing after the intervention.

<table>
<thead>
<tr>
<th>Name</th>
<th>Survey1</th>
<th>Survey2</th>
<th>Survey3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leva</td>
<td>Changjei</td>
<td>Changjei</td>
<td>Changjei</td>
</tr>
<tr>
<td>Veronica</td>
<td>Changjei</td>
<td>Changjei</td>
<td>Changjei</td>
</tr>
<tr>
<td>Ross</td>
<td>Changjei</td>
<td>Changjei</td>
<td>Changjei</td>
</tr>
<tr>
<td>Lida</td>
<td>Simple and Quick</td>
<td>Changjei</td>
<td>Simple and Quick</td>
</tr>
<tr>
<td>Fanny</td>
<td>Simple and Quick</td>
<td>Changjei</td>
<td>Simple and Quick</td>
</tr>
<tr>
<td>David</td>
<td>Changjei</td>
<td>Changjei</td>
<td>Simple and Quick</td>
</tr>
<tr>
<td>Wylde</td>
<td>Changjei</td>
<td>Changjei</td>
<td>Simple and Quick</td>
</tr>
<tr>
<td>Wyne</td>
<td>Changjei</td>
<td>Guangdong</td>
<td>Changjei</td>
</tr>
<tr>
<td>Kinfley</td>
<td>Changjei</td>
<td>Quick Code</td>
<td>Quick Code</td>
</tr>
</tbody>
</table>

The Chinese input method was a real hurdle for teachers to overcome when using IT (South China Morning Post, 2001). As teachers were not comfortable using the Changjei input method, they could only teach their students the Simple and Quick input method which requires students to have a
lot of patience to choose the right word from pop-up lists of words. Though tablets are provided in the MMLC and computer room for students to enter Chinese characters, frustrated students often damaged the writing tablets by hitting the pen against the tablet, or throwing the pen on the desk. While teachers in other parts of the world use IT as mindtools (Jonassen, 1996, 2000; Jonassen, Car & Yueh, 1998) such as semantic organisation tools, semantic networking, visualisation tools, conversation tools, and knowledge construction, Hong Kong teachers use IT mainly as multimedia presentations in a teacher-centred paradigm. The difficulty in entering Chinese efficiently is a major barrier in using IT in teaching and learning (South China Morning Post, 2001).

4.3.3.6 FULL-FEATURED SOFTWARE

While young children in English speaking countries can use simple to use word processors with interesting functions mentioned in Section 2.7.7, Hong Kong young children use full-featured software like Microsoft Word®, Microsoft Excel® and Microsoft PowerPoint®. Philanthropy Primary School, just like other schools in Hong Kong, installed Microsoft Chinese Windows® and Microsoft Office®. Young children and teachers alike, all use full-featured software. Although it is called Chinese Windows, it accepts and displays Chinese characters and the menus are in Chinese, the operations are just the same as the English commercial version. The lack of a simple to use Chinese word processor is also a hurdle in giving students projects which require them to do Chinese text processing.

4.3.4 TEACHERS’ TIME

As revealed by several surveys shown in Section 2.7.5.2, Hong Kong school teachers are extremely time-poor. Besides teaching, teachers are required to correct homework and assignments, compile test and examination papers, mark test and examination scripts, look for and develop teaching materials, prepare lessons, and manage the pupils. Panel chairs check the exercise books yearly to ensure teachers follow the schedule. Teachers have to
take administrative work, lead or coach extracurricular activities and other non-teaching duties which take a lot of time. There is little time left for teachers to learn more about IT, to use IT more frequently, and to share with colleagues the successes or problems in incorporating IT in their own teaching, unless the school authority creates more time for teachers, such as setting aside a free period for PAR activities. This tension between workload and expectations to adopt IT created a real barrier to change.

Philanthropy Primary School is located in an old resettlement estate where the population is aging and the birth rate falling. The school building is old. Hence the school is struggling for survival and actively seeking new enrolments to bolster its student numbers. Educational innovations have been introduced to attract Primary One students. Helping teachers to teach and students to learn using IT is a selling point given the perception that IT is a significant skill required for many careers. Hence, the school administration supported the introduction of IT and was keen to develop teachers’ skills.

The administration at Philanthropy Primary School responded to the problem in the year 2000-01 and 2001-02, by providing a free period for the PAR activities. However, it was very tempting for senior teachers and panels to make use of the time for PAR briefings and announcements about other matters related to the school. So although a full period was provided it was not utilised appropriately during the study.

4.3.5 IT TRAINING

Given the rapid development of IT, it is necessary for teachers to take IT training and professional development. Training which focussed on basic technical skill development was a priority and although many teachers participated in training programs organised by tertiary institutions and private companies endorsed by the Education and Manpower Bureau, they often expressed their concern about lack of training. In fact, there were several teachers in the school, who attended the 120-hour advanced training course, yet from the survey results, some of them did not show high perceptions of their own IT skills, or a high sense of self-efficacy in the use of technology. After the school-based, on-site training sessions provided by their peers on IT
knowledge and skills, teachers’ perceptions of their own IT skills and self-efficacy in using IT in teaching increased significantly. It means school-based, on-site training tutored by peers is effective in bringing teachers perceptions and self-efficacy.

4.4 INCENTIVES FOR INCORPORATING IT IN TEACHING

Although there were barriers and obstacles that prevented teachers from using IT in their teaching, there were, fortunately, incentives encouraging teachers to do so. Four major incentives are discussed below.

4.4.1 EMB STIPULATION

The EMB stipulated that teachers had to demonstrate the required IIT and UIT Competences before the end of the 2002-03 school year and use IT in 25% of their teaching (EMB, 1998). Providing evidence of higher competence levels may receive favourable consideration in teachers’ promotion or in changing schools, but for those who are not able to provide evidence of IT competence attainment termination of employment might be the result. The stipulation from EMB is an incentive as well as a threat, which forced teachers to attain the required knowledge, skills and techniques.

4.4.2 VISIONARY PRINCIPAL WITH LEADERSHIP

The principal of Philanthropy Primary School envisaged the poor image given by the old school building in the potential crises bought about by declining primary school student numbers. She was able to establish a sense of urgency (Kotter, 1996) about the school closure and teacher redundancy, and promoted the image of an IT rich school to save the school. She created a guiding coalition (Kotter, 1996) to mobilise teachers working together. She developed a vision and mission (Kotter, 1996) for the school, and was able to communicate the vision and mission with the teachers. She convinced the young IT competent teachers to take the roles of tutors and IT Team members and persuaded teachers to participate in the study (Kotter, 1996). She was brave enough to give teachers more time for being tutors and IT Team members. Teachers were also given more time for learning and preparing teaching IT related materials. Thus she had exhibited leadership in the study (Kotter, 1996).
4.4.3 TEACHERS’ AWARENESS OF THE ADVANTAGES OF INCORPORATING IT IN TEACHING

The articles in the teachers’ portfolio revealed that teachers were influenced by the government, the EMB, the principals, colleagues, press, and TV and were aware of that IT was good for teaching and learning. They held positive views towards incorporating IT in teaching and believed that IT could enhance students’ learning.

4.4.4 SCHOOL SUPPORT

The school authorities believed IT was beneficial to teaching and learning, and envisaged incorporating IT as a way to promote the image of the school, so teachers were supported in participating in the training sessions and tutors were given a lighter teaching load so that they could have time to prepare teaching and develop materials.

4.5 TEACHERS’ IT COMPETENCE

The training sessions were cleverly planned with the teaching of the knowledge, skills and techniques required to use IT effectively embedded with hands-on practical exercises targeting the requirements of the IT competence levels. They gave teachers opportunities to practice and transfer the skills to classroom teaching. After the training sessions, out of 31 teachers included in the study, 22 of them attained the Intermediate IT (IIT) Competence Level. They were able to use Microsoft Word® to design examination papers which contained conventional questions, fill-in-the-bank and multiple choice questions. They could design and produce a teaching package using presentation software, which demonstrated the appropriate use of hyperlinks, graphics, video, sound, action button, text effects, and other components in animation mode. They could also design and produce a simple personal website. They needed to draw graphics using a drawing package, capture video signals in AVI format, and put them into the presentation file or website. It is quite a difficult task to fulfil the requirements for attaining the IIT competence level (please refer to Appendix L for more detailed information). Eight teachers attained the Upper Intermediate IT (UIT) Competence Level, which required more in-depth study of the packages and more advanced skills in using the

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packages, as well as ability to use IT in teaching and learning to understand the rationale, advantages and disadvantages of using IT in teaching (Appendix M). According to the regulations, teachers who did 120-hour advanced courses were regarded as reaching the Advanced IT (AIT) level and did not need to present a portfolio, but teachers at Philanthropy Primary School who did the 120-hour advanced course decided to do the IIT portfolio. This meant they could work with other teachers to attain the stipulated requirement. Calculating the number of participants in the study at the end of 2001-2002 academic year, the percentage of IIT was 71% and UIT was 26%. On teachers' attainment of IT competence, the school was one year ahead of the time set by the Education and Manpower Bureau.

4.6 CONCLUSION

The situation analysis has revealed that many infrastructural, resource, and culturally related barriers existed at Philanthropy Primary School that hindered the effective and convenient use of IT in teaching and learning. The culture of subject-based, examination-oriented, norm-referenced, schedule-tight programs and emphasis on marks often forced teachers to adopt a teacher-centred pedagogy. The stipulation from the government might serve more as a threat than as an incentive. The environment was not favourable for teachers to incorporate IT in teaching. Nevertheless, teachers were aware of the advantages of incorporating IT in teaching and learning, and the school was willing to support teachers to experiment with the incorporation of IT in teaching. Teachers wanted to attain IT Competency and the school wanted their teachers to fulfil the requirement of using IT in 25% of their teaching. Thus in spite of all these adverse conditions, teachers and the school authorities saw value in participating in the study. Besides the attainment of IT competency reported in the previous section, the following chapters report important findings associated with teachers’ attempts to use IT in teaching.
CHAPTER 5 QUANTITATIVE RESULTS OF THE STUDY

5.1 CHAPTER OVERVIEW

This chapter reports the analysis of data collected through surveys and teachers’ timetable reports gathered during the project. This chapter is broadly divided into three parts. The first part, from Section 5.2 to 5.4, consists of an examination of the changes of teachers’ practices over two years. It includes changes in frequencies of teachers’ use of computers, teachers’ perceptions of their own IT skills, and their self-efficacies in using IT in teaching, and the significance of the changes. The second part (Section 5.5) consists of analyses of timetable reports generated by teachers in the two years of the study. There were 27 weeks in the first year in which two were non-teaching weeks, so there were only 25 weeks of timetable reports. There were 34 weeks in the second year in which there were also two non-teaching weeks, so there were only 32 weeks of timetable reports. The changes in the numbers of strategies incorporating IT in teaching, and periods and weeks using IT in teaching over the two years are analysed, and the significance of these changes will also be examined using. The third part (Section 5.6) examines the strategies incorporating IT in teaching used by teachers in these two years to find the common strategies. Finally the chapter is concluded in Section 5.7.

5.2 FREQUENCIES OF USE OF COMPUTERS BY TEACHERS

One of the purposes of a school-based, on-site, ongoing IT staff development program was to encourage teachers to use computers in their teaching after the training sessions. Teachers were surveyed before the study using the Chinese Information Technology in Teaching Efficacy Beliefs Instrument (CITITEBI, Appendix A) that had demographic and other variables including teachers’ frequency of use of computers. A slightly modified version, which included survey items on teachers’ perceptions of the applications of IT at their school, was administered at the end of the first year of the study (Appendix B). At the end of the second year, a questionnaire with some more items on perceptions and views of using IT in teaching (Appendix C) was administered to the subjects, as described in Chapter 3: Methodology (Section 3.4.3.3). The data from these three surveys were compared using the general
linear model (repeated-measures) and t-test and the information was extracted.

On the item “Frequency of computer access”, teachers were asked to select, at each of the three surveys, one of the following five options to indicate their frequencies of use of computers: “Never” used computers - non-user; “Several times a year” - occasional user; “Once a week” - casual user; “Several times a week - frequent user; “at least once daily” - serious user. Teachers who missed any options in this item were not included in the calculation. It was found that there were differences in the frequencies of teachers’ use of computers over the two years period. The number of teachers in each category in each survey is presented as in the following Table 5.1 (cf. Tables G.2-G.4, Appendix G)

### 5.2.1 CHANGES IN FREQUENCIES OF USE OF COMPUTERS BY TEACHERS

<table>
<thead>
<tr>
<th>Cat.</th>
<th>Before</th>
<th>Year one</th>
<th>Year two</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Freq %</td>
<td>Mid-Freq %</td>
<td>Post-Freq %</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>16.1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>38.7</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>29.0</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>16.1</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100</td>
<td>31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-User: Never used computers</td>
</tr>
<tr>
<td>Occasional User: Several times a year</td>
</tr>
<tr>
<td>Casual User: Once a week</td>
</tr>
<tr>
<td>Frequent User: Several times a week</td>
</tr>
<tr>
<td>Serious User: At least once a day</td>
</tr>
</tbody>
</table>

From Table 5.1, we can see there was no non-user of computer. All teachers used computers before and during the study. After the IT training sessions in the first year, teachers used more computers, therefore there were decreasing numbers of occasional and casual users and an increasing numbers of frequent and serious users. At the end of the second year, one teacher moved up from the occasional user group to the casual user group, and one teacher moved up from the frequent user group to the serious user group. Were the
changes of teachers’ frequencies in using computers significant over these two years? The following section examines the significance of the change by statistical method.

5.2.2 REPEATED-MEASURES ANALYSIS OF VARIANCE OF TEACHERS’ FREQUENCIES OF USE OF COMPUTERS

As mentioned in Chapter 3: Methodology, Sections 3.4.3.3 and 3.4.4.3, and the previous section, teachers’ initial frequency of computer use before the study was found through the first survey. The change in the frequencies of the use of computers after a series of school-based, on-site, ongoing, and peer-tutored training sessions and participatory action research (PAR) meetings was found through the second survey. The change in the frequencies of the use of computers after another year of PAR meetings and timetable report was found by the last survey. The three means of the frequencies were $\mu_1 = 2.45$, $\mu_2 = 2.94$, $\mu_3 = 3.00$ (Table 5.3). It is necessary to find out whether there are any significant differences between these means. Given the same group of the 31 teachers were surveyed three times, according to Grimm (1993), a repeated-measures design can be applied. Hence, an analysis using general linear model (repeated-measure) was performed.

There is only one null hypothesis: $H_0: \mu_1 = \mu_2 = \mu_3$.

The alternate hypothesis is that at least two of the group means are not equal.

$H_1$: the null hypothesis is false.

From the GLM Repeated-Measure analysis, it shows that there is an overall statistically significant difference among the three means of frequencies of using computers at the .01 level, $F(2, 60) = 7.032, p<.01$ (Table G.8, Appendix G). The null hypothesis shows that there is no difference among the three means has to be rejected, and the alternate hypothesis that at least two of the group means are not equal holds. The Partial Eta Squared = .190, according to Cohen’s guideline (1977), the effect of the change was small, i.e., the changes among these three means were barely meaningfully revealed by the small number of participants.
5.2.3 PAIRWISE COMPARISONS OF THE DIFFERENCES IN FREQUENCIES OF USE OF COMPUTERS BY TEACHERS

Following the conclusion from the previous section that there was an overall significant difference in the means of the three frequencies of teachers’ use of computers, the next step was to find out whether there were any significant changes in the means of the frequency of using computers from before the study to the middle of the study, Pre-Freq – Mid-Freq (Pair 1); from the middle to the end of the study, Mid-Freq – Post-Freq (Pair 2); and also from before the study to the end of the study, Pre-Freq – Post-Freq (Pair 3), by using Pairwise Comparison. The results are shown in Table 5.2.

There are three null hypotheses in the Paired Samples Test:

- Null hypothesis 1: There is no difference in the means of the frequency of using computers from before to the middle of the study.
- Null hypothesis 2: There is no difference in the means of the frequency of using computers from the middle to the end of the study.
- Null hypothesis 3: There is no difference in the means of the frequency of using computers from before to the end of the study.

Table 5.2
Paired samples test of teachers’ frequency of using computers.

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Diff. of Mean</th>
<th>S.D.</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Freq – Mid-Freq</td>
<td>-0.484</td>
<td>1.029</td>
<td>0.185</td>
<td>-0.861</td>
<td>-2.619</td>
<td>30</td>
<td>0.014</td>
</tr>
<tr>
<td>Mid-Freq – Post-Freq</td>
<td>-0.065</td>
<td>0.854</td>
<td>0.153</td>
<td>-0.378</td>
<td>-0.421</td>
<td>30</td>
<td>0.677</td>
</tr>
<tr>
<td>Pre-Freq – Post-Freq</td>
<td>-0.548</td>
<td>0.768</td>
<td>0.138</td>
<td>-0.830</td>
<td>-3.978</td>
<td>30</td>
<td>0.000</td>
</tr>
</tbody>
</table>

From Table 5.2, for the pair Pre-Freq and Mid-Freq, \( t(30) = -2.619 \), \( p < .05 \). There is a significant difference between these two mean frequencies at the .05 level, therefore null hypothesis 1 can be rejected. As the difference of the means is negative, it means there was significant increase in the reported average frequencies of teachers’ use of computers in the first year of the study.
For the pair Mid-Freq and Post-Freq, $t(30) = -0.421, p = .677$. There is no significant difference between these two mean frequencies. Null hypothesis 2 cannot be rejected. As the difference of the means is negative, it means that although there was an increase in the average frequencies of teachers’ use of computers reported at the end of the first and second years. But the increase during this period of time is not statistically significant.

For the pair Pre-Freq and Post-Freq, $t(30) = -3.978, p < .01$. There is a significant difference between these two means of frequencies at the .01 level. Null hypothesis 3 has to be rejected. Again, as the difference of the means is negative, it shows there was significant increase in the average frequencies of teachers’ use of computers reported before and at the end of the second year of the study.

As the study involved only one school, the number of participants, after including only those teachers who served for the two years and eliminating the invalid selected options, was only 31. It would be informative to look at the significance from the effect size calculations. Table 5.3 show the effect sizes of the changes between the three pairs.

<table>
<thead>
<tr>
<th>Mean frequencies</th>
<th>Changes in means of frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Freq</td>
</tr>
<tr>
<td>Means</td>
<td>2.45</td>
</tr>
<tr>
<td>SD</td>
<td>0.96</td>
</tr>
<tr>
<td>Variance</td>
<td>0.92</td>
</tr>
<tr>
<td>PooledSD</td>
<td></td>
</tr>
<tr>
<td>Effect Size</td>
<td></td>
</tr>
</tbody>
</table>

From Table 5.3, the effect sizes of the changes from before to one year after the study and from before to the end of the study were medium, 0.528 and 0.606 respectively, while the effect size of the increase in the second year alone was very small, at only 0.069. Using Cohen’s guideline (1977), these values inform that the effect of the increases from before the study to the end of the first year and to the end of the second year was obvious and meaningful, but the effect of the increase in the second year was not large enough to be revealed as a meaningful change by the small number of participants.
5.2.4 CORRELATION BETWEEN AGE AND THE FREQUENCY OF USE OF COMPUTERS

Data from Table 5.4 shows that older teachers were less inclined to use computers compared with the younger ones before the study, \( r(31) = -0.355, p<.05 \). However, as the study progressed, the correlation became weaker and no longer significant, as can be seen from the correlation coefficients in the second and third surveys.

Table 5.4

<table>
<thead>
<tr>
<th></th>
<th>Pre-Freq</th>
<th>Mid-Freq</th>
<th>Post-Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>-0.355*</td>
<td>-0.308</td>
<td>-0.277</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.05</td>
<td>0.091</td>
<td>0.131</td>
</tr>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed)

Figure 5.1 shows the scatter plot of age groups of teachers versus their frequency of use of computers at the end of the study (Post-Freq). Here Age Group three consisted of teachers from 21 to 30, group four from 31 to 40, group five from 41 to 50 and group six over 50 years of age. Except one teacher in the age group 41 to 50 who remained to be an occasional user, and there was no occasional and casual users in the age group 31 to 40, there were casual to serious users in age groups from 21 to 30, 41 to 50 and over 50 at the end of the intervention. So it is not true that younger teachers used computers more often, or older teachers used computers less often.
5.2.5 COMPARING MEANS AND PERCENTAGES OF TEACHERS’ FREQUENCY OF USE OF COMPUTERS BY AGE

From Table 5.5, teachers aged over 50 increased their frequency more than the other groups, and there was slight increase in the second year. For the age group 41-50, the increase was just next to the oldest group and their frequency could be sustained. Contrary to the common beliefs that older people are generally more technophobic (Bosnan, 1998), the older teachers’ frequency increased more than that of the younger ones. As the frequency of use of computers of these teachers were initially low, they were brought up to a higher level after the training sessions and hands-on experience, and the frequency of their use of computers sustained for the majority of teachers and slightly increased for some teachers during the second year.
Table 5.5

<table>
<thead>
<tr>
<th>Age group</th>
<th>Yearly values</th>
<th>Changes in average values</th>
<th>% changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Mid Post</td>
<td>Mid-Pre Post-Mid Post-Pre</td>
<td>Mid-Pre Post-Mid Post-Pre</td>
</tr>
<tr>
<td>2+3; 21-30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>2.73 3.27 3.18</td>
<td>0.54 -0.09 0.45</td>
<td>19.78% -2.75% 16.48%</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.01 0.9 0.87</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>11 11 11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4: 31-40</td>
<td>2.78 3.5 3.5</td>
<td>0.67 0.5 0</td>
<td>-14.29% 16.67% 0.00%</td>
</tr>
<tr>
<td>Mean</td>
<td>2.11 2.78 3.5</td>
<td>0.5 0.58 0.58</td>
<td></td>
</tr>
<tr>
<td>S.D.</td>
<td>0.58 0.82 0.87</td>
<td>0.58</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>4 4 4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5: 41-50</td>
<td>2.71 2.57 2.57</td>
<td>0.71 0.14 0.76</td>
<td>38.17% 5.45% 45.70%</td>
</tr>
<tr>
<td>Mean</td>
<td>1.86 2.57 2.57</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>S.D.</td>
<td>0.78 0.83 0.98</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>9 9 9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6: Over 50</td>
<td>2.94 2.94 2.94</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>2.45 2.94 2.94</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>S.D.</td>
<td>0.96 0.89 0.86</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>7 7 7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.6 Conclusion on Teachers’ Frequency of Computer Use

As it was a requirement by many schools, including Philanthropy Primary School, that teachers had to word-process their examination papers, there was no non-user of computers in the school. Most of the teachers were either occasional or casual users before the study. The frequency of teachers’ use of computers increased significantly from before the study to one year after the study. During this time a pre-intervention seminar, two workshops, a series of 18 school-based, on-site, ongoing, peer-tutored training sessions and 25 teaching weeks plus two non-teaching weeks of PAR meetings for all teachers were carried out. Here teachers in the over 50 years of age group who had lowest frequency of computer use had the largest increase while middle aged teachers in the 31-40 age group with highest frequency had no change. In the second year, there was still an increase in the frequency of computer use, although not significant enough statistically. The main activities in this period were PAR meetings where group members could seek help from their group leaders and colleagues. The overall increase in the frequency of teachers’ computer use from before the study to the end of the study after two years was significant. As teachers participated in the professional initiative, the link between the intervention and the increase in teachers’ use of computers is
evident.

5.3 TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS

In the same CITITEBI questionnaire surveys conducted, at the one year point and at two years described in Section 5.2, teachers were surveyed to see the effects of the training sessions on their perceptions of their own skills in using computers. The survey explored their perceptions of their hardware skills, for example setting up a computer by connecting the peripherals, using scanners, software installation, and using applications such as Microsoft Word®, Microsoft PowerPoint®, Microsoft Excel®, database, Internet, email, before and after the training sessions. For each item, teachers were asked to rate themselves as “Cannot”, value = 0; “Know a little”, value = 1; “Rather good”, value = 2; and “Expert”, value = 3. The sum of these numbers represented a teacher’s overall perceptions of his/her own IT skills. The value before the intervention was PrITS (Pre-study IT Skills). After attending 18 IT training sessions conducted by their colleagues with contents decided by themselves, in the Multimedia Language Centre at their own school, and with hands-on workshops in the first year of the study, the sum of each teacher’s perceptions of his/her own IT skills was MITS (Mid-study IT Skills). At the end of the study, each teacher’s perceptions of his/her own IT skills was PoITS (Post-study IT Skills) respectively. The mean values of PrITS, MITS and PoITS were \( \mu_1 = 14, \mu_2 = 21.68, \mu_3 = 17.32 \) respectively (Table 5.7 and Table H1 in Appendix H). Similar to the frequency of teachers’ use of computers discussed above, repeated-measure ANOVA is used. There is only one null hypothesis: \( H_0: \mu_1 = \mu_2 = \mu_3 \), i.e., there is no significant difference between the three means of teachers’ perceptions of their own IT skills over the two years.

The alternate hypothesis is that at least two of the group means are not equal.

\( H_1: \) the null hypothesis is false.

From the analysis, it shows that there is an overall significant difference among the three means of teachers’ perceptions of their own IT skills at the .01 level, \( F(2, 60) = 19.525, p < .01 \) (Table H.6 in Appendix H). The null hypothesis
that there is no difference among the three means has to be rejected, and the alternate hypothesis that at least two of the group means are not equal holds. The Partial Eta Squared = .394. According to Cohen’s guideline (1977), the effect of the change was moderate, i.e., the changes among these three means were moderately meaningful revealed by the small set of data.

5.3.1 PAIRWISE COMPARISONS OF THE DIFFERENCES IN TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS

Following the conclusion from the previous section that there was an overall significant difference in the three means of teachers’ perceptions of their own IT skills, the next step was to find out whether there were any significant changes in the means of teachers’ perceptions of their own IT skills from before the study to the middle of the study, PrITS - MITS; from the middle of the study to the end of study, MITS - PoITS; and also from before the study to the end of the study, PrITS - PoITS, by means of Pairwise Comparison.

There are three null hypotheses in the Paired Samples Test:

- Null hypothesis 1: There is no difference in the means of teachers’ perceptions of their own IT skills from before the study to the middle of the study.
- Null hypothesis 2: There is no difference in the means of teachers’ perceptions of their own IT skills from the middle to the end of the study.
- Null hypothesis 3: There is no difference in the means of teachers’ perceptions of their own IT skills from before the study to the end of the study.

From Table 5.6 below, for the pair PrITS and MIT, \( t(30) = -6.751, p < .01 \). There is significant difference between these two means at the .01 level. Null hypothesis 1 has to be rejected. As the difference of the means is negative, it means there was significant increase in the average value of teachers’ perceptions of their own IT skills reported at the end of the first year of the study compared to the beginning of the study.

For the pair MITS and PoITS, \( t(30) = 3.448, p < .01 \). There was also significant difference between these two means at the .01 level. Null hypothesis
2 has to be rejected. As the difference of the means was positive, it means that there was a decrease in the mean of teachers’ perceptions of their own IT skills reported at the end of the first and second years, and the change during this period of time was also significant at the .01 level.

Table 5.6
**Paired samples test of teachers’ perceptions of their own IT skills.**

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Diff. of Mean</th>
<th>S.D.</th>
<th>Std. Error</th>
<th>Mean</th>
<th>95% Confidence Interval</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 PrITS – MITS</td>
<td>-7.677</td>
<td>6.332</td>
<td>1.137</td>
<td>-10.000</td>
<td>-5.355 -6.751</td>
<td>30</td>
<td>0.000</td>
</tr>
<tr>
<td>Pair 2 MITS – PoITS</td>
<td>4.355</td>
<td>7.031</td>
<td>1.263</td>
<td>1.776</td>
<td>6.934 3.448</td>
<td>30</td>
<td>0.002</td>
</tr>
<tr>
<td>Pair 3 PrITS - PoITS</td>
<td>-3.323</td>
<td>7.190</td>
<td>1.291</td>
<td>-5.960</td>
<td>-0.685 -2.573</td>
<td>30</td>
<td>0.015</td>
</tr>
</tbody>
</table>

For the pair PrITS and PoITS, \( t(30) = -2.573, \ p<.05 \). There was a significant difference between these two means at the .05 level and null hypothesis 3 can be rejected. As the difference of the means is negative, it means there was significant increase in the means of teachers’ perceptions of their own IT skills reported before and at the end of the second year of the study.

Table 5.7
**Effect size of the changes of teachers’ perceptions of their own IT skills.**

<table>
<thead>
<tr>
<th></th>
<th>PrITS</th>
<th>MITS</th>
<th>PoITS</th>
<th>MITS-PrITS</th>
<th>PoITS-MITS</th>
<th>PoITS-PrITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>14</td>
<td>21.677</td>
<td>17.323</td>
<td>7.677</td>
<td>-4.355</td>
<td>3.323</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>9.546</td>
<td>8.424</td>
<td>6.670</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance</td>
<td>91.133</td>
<td>70.959</td>
<td>44.492</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std. Error</td>
<td>1.715</td>
<td>1.513</td>
<td>1.198</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PooledSD</td>
<td></td>
<td>9.003</td>
<td>7.598</td>
<td>8.235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect Size</td>
<td></td>
<td>0.853</td>
<td>-0.573</td>
<td>0.403</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As in the frequencies of teachers’ use of computers in the previous section, it would be informative to look at the meaningfulness of the changes revealed by the data from the effect size calculations. From Table 5.7, the effect size of the change from before to one year of the study was 0.853 which was positive and large, and from the first to the second year of the study was –0.573 which was medium but negative. The overall increase in teachers’ perceptions of their
own IT skills was 0.403 which was also medium in magnitude. Using Cohen’s
guideline (1977), these values demonstrate that the effect of the increases from
before the study to the end of the first year was large and meaningful, but the
effect sizes of the decrease from the end of the first year to the end of the
second year and the net increase from before the study to the end of the second
year were both medium in magnitude, and moderately meaningful in effect
revealed by the small number of participants.

5.3.2 COMPARING THE MEANS AND PERCENTAGES OF TEACHERS’
PERCEPTIONS OF THEIR OWN IT SKILLS BY GENDER

Table 5.8
Percentages and means of perception of teachers’ own IT skills with gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Pre</th>
<th>Mid</th>
<th>Post</th>
<th>Difference of Means between surveys</th>
<th>Percentage of Change between surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female:</td>
<td>10.76</td>
<td>19.57</td>
<td>15.95</td>
<td>8.81</td>
<td>3.62</td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>S.D.</td>
<td>5.485</td>
<td>7.033</td>
<td>5.661</td>
<td>5.661</td>
<td>5.661</td>
</tr>
<tr>
<td>Male:</td>
<td>20.8</td>
<td>26.1</td>
<td>20.2</td>
<td>5.3</td>
<td>5.9</td>
</tr>
<tr>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>S.D.</td>
<td>12.69</td>
<td>9.72</td>
<td>7.32</td>
<td>7.32</td>
<td>7.32</td>
</tr>
</tbody>
</table>

By comparing the differences of mean values and percentage changes of
female and male teachers’ perceptions of their own IT skills, Table 5.8 shows
that female teachers with a lower initial mean value of 10.76 had an increase in
their perceptions by 81.86% while male teachers with an initial value of 20.8
had an increase of only 25.48% after one year of the study. Though both
genders had a drop in the second year, the drop in male teachers was higher
(22.61%) than that in female teachers (18.49%). The net change in perceptions
of their own IT skills over the two years of study was an increase of 48.23% in
female teachers, but a drop of 2.88% in male teachers. The reasons for the drop
in male teachers will be studied by interviewing teachers and examined in
Section 11.3.2. The difference of perceptions of their own IT skills between the
means of the male and the female teachers was 10.04 before the study, to 6.53
after one year, and 4.25 after two years. The difference became smaller and
smaller as the study progressed.

The results showed that more and more female teachers had gained confidence in their IT skills after the school-based, on-site and ongoing program with IT training sessions and the PAR in the first year, and the perceptions of their own IT skills increased much more than that of the male teachers. As the differences between the male and female teachers became smaller each time over the three surveys, the correlation became weaker and weaker as the study progressed. But the means of the male teachers’ perceptions in the three surveys were higher than those of the females. In order to see more clearly how the perceptions of both genders changed, a cross-tabulation examination was performed.

5.3.3 CROSS-TABULATION OF TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS WITH GENDER

Table 5.9 shows the distributions of female and male teachers’ perceptions of their own IT skills in the three surveys. There were 57% female teachers at the lowest range, 33% at the low range and only 10% in the high range. The distribution of the male teachers was in the shape of a tick, with a large number of 40% in the lowest range and the percentage went down to 10% in the low range. The percentage went up from 10% through 20% at the high range and finally to 30% in the highest before the study.

After the school-based, on-site and ongoing IT training sessions and PAR activities, 52% of female teachers’ perceptions of their own IT skills moved up from the lowest range to the low and high ranges and a significant percentages of teachers moved from the low and the high ranges to the high and highest ranges. The result was 67% of teachers in the low range, 19% into the high range and 10% to the highest range, leaving only 5% in the lowest range. All 40% of the male teachers’ perceptions of their own IT skills which was in the lowest range also moved up and 10% moved to the highest range, and there was no male teacher in the lowest range.

At the end of the second year, all female and male teachers with perceptions in the highest range reported a drop to the high or lower ranges. This was 40% for the male teachers, and only 10% for the female teachers. The
majority of teachers, 76% of female and 50% of male teachers, stayed in the low range. The female teachers had a 5% drop while the male teachers had a 10% drop to the lowest range during the period of sustainability.

Table 5.9
Cross-tabulation of teachers’ perceptions of their own IT skills with gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Pre-ITS</th>
<th>Mid-ITS</th>
<th>Post-ITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceptions of own IT skills</td>
<td>Lowest 1-10</td>
<td>Low 11-20</td>
<td>High 21-30</td>
</tr>
<tr>
<td>Pre-ITS</td>
<td>57%</td>
<td>33%</td>
<td>10%</td>
</tr>
<tr>
<td>Mid-ITS</td>
<td>5%</td>
<td>67%</td>
<td>19%</td>
</tr>
<tr>
<td>Post-ITS</td>
<td>10%</td>
<td>76%</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-ITS</td>
<td>40%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-ITS</td>
<td>40%</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>Post-ITS</td>
<td>10%</td>
<td>50%</td>
<td>40%</td>
</tr>
</tbody>
</table>

From the analysis above, it is clear that there was a big increase in teachers’ perceptions of their own IT skills after the school-based, on-site and ongoing IT training sessions and PAR activities. Male teachers’ perceptions of their own IT skills were higher than those of the female teachers, but there were more increase and less decrease in the female teachers’ perceptions than those of the male teachers. There was a clear enhancement in female teachers’ perceptions of their own IT skills after the training and the study, which can be seen by inspection from Table 5.9. The evidence suggests that teachers with lower initial perceptions of their own IT skills have benefited more from the school-based, on-site and ongoing training sessions with PAR activities than those with higher initial perceptions.

5.3.4 CORRELATION BETWEEN TEACHERS’ PERCEPTION OF THEIR OWN IT SKILLS AND AGE

Table 5.10
Correlation between teachers’ perceptions of their own IT skills and age.

<table>
<thead>
<tr>
<th>Age</th>
<th>IT Skills before study</th>
<th>IT Skills after 1 year</th>
<th>IT Skills after 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>-0.538**</td>
<td>-0.584**</td>
<td>-0.438*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.002</td>
<td>0.001</td>
<td>0.014</td>
</tr>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

As seen in Table 5.10, teachers’ perceptions of their own IT skills were
significantly negatively correlated to age in all of the three surveys, the first two at the .01 level and the last one at the .05 level. It means that older teachers had lower perceptions of their own IT skills while younger teachers had higher perceptions. The situation was obvious before and one year after the study, but improved a little after the period of sustainability. In order to find out what had happened between the young and old teachers, the phenomenon was explored in more details in the next section.

5.3.5 COMPARING THE MEANS AND PERCENTAGES OF TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS BY AGE GROUPS

The change in the perceptions of teachers’ own IT skills can be further investigated through different age groups. Similar to the frequency of use of computers, Table 5.11 shows that teachers’ perceptions of their own IT skills increased more and were sustained better for older teachers than younger ones and those with low initial values than the higher ones. Teachers in age group six had lowest mean perceptions of only 7.14 which were only 36% of the perceptions of younger teachers in age group three. Teachers in age group five had a mean perceptions of 10 which was only about half of that of the young teachers. Thus older teachers had lower perceptions of their IT knowledge and skills.
Table 5.11
Change of teachers’ perception of their own IT skills versus age groups.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Yearly values</th>
<th>Changes in average values</th>
<th>Percentage changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PrITS</td>
<td>MidITS</td>
<td>PostITS</td>
</tr>
<tr>
<td>3: 21-30</td>
<td>Mean 19.64</td>
<td>26.82</td>
<td>21.64</td>
</tr>
<tr>
<td></td>
<td>S.D. 9.96</td>
<td>9.77</td>
<td>7.46</td>
</tr>
<tr>
<td></td>
<td>N 11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>4: 31-40</td>
<td>Mean 19.5</td>
<td>25.75</td>
<td>15.25</td>
</tr>
<tr>
<td></td>
<td>S.D. 14.91</td>
<td>8.77</td>
<td>5.12</td>
</tr>
<tr>
<td></td>
<td>N 4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5: 41-50</td>
<td>Mean 10</td>
<td>18.44</td>
<td>14.11</td>
</tr>
<tr>
<td></td>
<td>S.D. 3.08</td>
<td>4.19</td>
<td>6.11</td>
</tr>
<tr>
<td></td>
<td>N 9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>6: Over 50</td>
<td>Mean 7.14</td>
<td>15.43</td>
<td>15.86</td>
</tr>
<tr>
<td></td>
<td>S.D. 3.02</td>
<td>3.64</td>
<td>3.44</td>
</tr>
<tr>
<td></td>
<td>N 9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>Mean 14</td>
<td>21.68</td>
<td>17.32</td>
</tr>
<tr>
<td></td>
<td>S.D. 9.55</td>
<td>8.42</td>
<td>6.67</td>
</tr>
<tr>
<td></td>
<td>N 31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

It is interesting to note again that older teachers in group five had largest increase of 8.44 after the training sessions and PAR activities, followed by teachers of group six with 8.29. Due to the low initial value, the percentage increase of group six was 116%, which was the highest in the first year. This group of low perceptions teachers had a small increase during the period of sustainability with PAR activities while other groups reported a decrease in their perceptions. The change in perceptions of their own IT skills of group six eventually excelled the other groups in the mean value of perceptions at the end of the study.

5.3.6 CROSS-TABULATION OF TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS WITH AGE

As demonstrated in Table 5.12, different age groups of teachers had different patterns of change in their perceptions of IT skills. Table 5.11 shows that teachers in age group six there mainly in the lowest perceptions, and a few in age group five had higher perceptions. It is interesting to note, however, that there was a wide spread of perceptions before the intervention. There were approximately the same number of teachers in the four groups of perceptions in age groups three and four. It means that not all younger teachers were well
trained or competent in IT.

After the training sessions and PAR activities in the first year, there was an increase across the board. All those with low initial perceptions had increased and there was no teacher remaining in the lowest category for the first three groups, except in age group six where five out of six teachers moved from the lowest to the low range, leaving only one teacher in the lowest range. There were teachers moving from the low to the high range for the younger three groups, and some teachers moved from the high to the highest range for age groups three and four. However, none of teachers in group six moved to the high or highest category.

Table 5.12
Cross-tabulation of teachers’ perceptions versus age groups.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>IT Skills</th>
<th>Lowest 1-10</th>
<th>Low 11-20</th>
<th>High 21-30</th>
<th>Highest 31-40</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3: 21-30</td>
<td>PrITS</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MITS</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PoITS</td>
<td>5</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4: 31-40</td>
<td>PrITS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MITS</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>PoITS</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5: 41-50</td>
<td>PrITS</td>
<td>6</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MITS</td>
<td>7</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PoITS</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6: Over 50</td>
<td>PrITS</td>
<td>6</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MITS</td>
<td>1</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PoITS</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At the end of second year, the perceptions of teachers in the low range of age group three (young) and six (over 50) were sustained, and the only teacher of group six increased her perceptions from the lowest to the low range, but one teacher in group four and two teachers in group five fell back to the lowest range. All those in the highest range of group three fell back to the high or low range. They were members of the IT Team. Teachers in group four fell even
further, from highest to low. Three of them are female, and the only male teacher was also a member of the IT Team. It is worth noting that teachers with low perceptions reported enhancement while teachers with high perceptions reported reduction in their perceptions of IT skills.

5.3.7 CONCLUSION ON TEACHERS’ PERCEPTIONS OF THEIR OWN IT SKILLS

From the analysis in the previous sections, older teachers had a lower mean of perceptions of their own IT skills. Younger teachers had wider spectrum of perceptions from lowest to highest ranges before the study. Female teachers also had lower mean perceptions as compared with male teachers. After the intensive training sessions and PAR activities, all teachers reported enhancement in their perceptions, with older teachers reported higher difference and more percentage change than younger teachers. Teachers serving as IT Team members who conducted the training sessions reported highest perceptions of their own IT skills. All teachers in the lowest range, except one, reported enhancement from the lowest to the low range of perceptions. During the second year where teachers were asked to teach with IT and there were PAR meetings to share experience, the perceptions of older teachers could be sustained at the low range, which was better than before. It means they viewed themselves as more capable to use IT after the intensive training sessions. However, the members of the IT Team, who conducted the training sessions, reported a drop of one to two levels of their own IT skills. As these results will inform research question two by indicator one that professional development like school-based, on-site and ongoing program with IT training sessions with PAR activities enhance teachers’ perceptions of their own IT skills, this unexpected outcome will be examined in more details in case studies in the following chapters.

5.4 SELF-EFFICACY IN USING IT IN TEACHING

There were items in the efficacy part of the questionnaire that solicited teachers’ beliefs about their ability to use IT in teaching. These items were adopted from Enochs et al.’s (1993) Microcomputer Utilization in Teaching Efficacy Beliefs Instrument (MUTEBI) and selected after factor analysis of a
pilot study in the Shatin district of Hong Kong (Section 3.4.3.3.1). For each item, teachers were asked to express their rating as “Strongly Disagree (SD)”: 1, “Disagree (D)”: 2, “Neutral (N)”: 3, “Agree (A)”: 4, and “Strongly Agree (SA)”: 5. The sum of the numbers corresponding to the labels represented teachers’ overall self-efficacy in using IT in teaching. The mean values of teachers’ Self-efficacy before the study, Pre-SE, at the end of the first year of the study, Mid-SE, and after the study, Post-SE, were $\mu_1 = 30.68$, $\mu_2 = 39.06$, $\mu_3 = 35.55$ respectively (Table I.1 in Appendix I). Similar to the frequency of teachers’ use of computers and their perceptions of their own IT skills discussed above, there is only one null hypothesis: $H_0$: $\mu_1 = \mu_2 = \mu_3$. That is, there is no significant difference between the three means of teachers’ self-efficacy in using IT in teaching over the two years.

The alternate hypothesis is that there is a significant difference between at least two means.

$H_1$: the null hypothesis is false.

From the analysis, it shows that there is an overall significant difference among the three means of teachers’ self-efficacy in using IT in teaching at the .01 level, $F(2, 60) = 22.71$, $p<.01$ (Table I.6 in Appendix I). The null hypothesis that there is no significant difference among the three means can be rejected, and the alternate hypothesis that there is a significant difference between at least two means holds. The Partial Eta Squared = .431, according to Cohen’s guideline (1977), the effect of the change was moderate, i.e., the changes among these three means were moderately meaningful revealed by the small set of data.

5.4.1 PAIRWISE COMPARISONS OF THE DIFFERENCES IN TEACHERS’ SELF-EFFICACY

Following the conclusion from the previous section that there was an overall significant difference between at least two out of the three means of teachers’ self-efficacy in using IT in teaching, the next step is to find out whether there are any significant changes in the means of teachers’ self-efficacy in using IT in teaching from before the study to the middle of the study, Pre-SE - Mid-SE; from the middle to the end of the study, Mid-SE - Post-SE;
and also from before the study to the end of the study, Pre-SE - Post-SE, by using Pairwise Comparison.

There are three null hypotheses in the Paired Samples Test:

- **Null hypothesis 1:** There is no difference in the means of teachers’ self-efficacy in using IT in teaching from before the study to the middle of the study.

- **Null hypothesis 2:** There is no difference in the means of teachers’ self-efficacy in using IT in teaching from the middle to the end of the study.

- **Null hypothesis 3:** There is no difference in the means of teachers’ self-efficacy in using IT in teaching from before the study to the end of the study.

From Table 5.13 below, for the pair Pre-SE and Mid-SE, $t(30) = -6.867$, $p<.01$. There was significant difference between these two means at the .01 level. Null hypothesis 1 can be rejected. As the difference of the means is negative, it means there was significant increase in the means of teachers’ self-efficacy in using IT in teaching reported from prior to the study to the end of the first year of the study.

For the pair Mid-SE and Post-SE, $t(30) = 3.443$, $p<.01$. There was a significant difference between these two means at the .01 level. Null hypothesis 2 can be rejected. As the difference of the means was positive, it means that there was a decrease in the means of teachers’ self-efficacy in using IT in teaching reported for the period from the end of the first year to the end of second years, and the decrease during this period of time was significant.

For the pair Pre-SE and Post-SE, $t(30) = -3.320$, $p<.01$. There was a significant difference between these two means at the .01 level. Null hypothesis 3 can be rejected and the alternative hypothesis that there was significant difference between the means of teachers’ self-efficacy in using IT in teaching before the study and that surveyed after two years. As the difference of the means is negative, it means there was significant increase in the means of teachers’ self-efficacy in using IT in teaching reported for the period, before to the end of the study.
Table 5.13
*Paired samples test of teachers’ self-efficacy in using IT in teaching.*

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Diff. of Mean</th>
<th>S.D.</th>
<th>Std. Error of Mean</th>
<th>95% Confidence Interval</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1  Pre-SE – Mid-SE</td>
<td>-8.39</td>
<td>6.80</td>
<td>1.22</td>
<td>-10.88</td>
<td>-5.89</td>
<td>-6.867</td>
<td>30</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Pair 2  Mid-SE – Post-SE</td>
<td>3.52</td>
<td>5.69</td>
<td>1.02</td>
<td>1.43</td>
<td>5.60</td>
<td>3.443</td>
<td>30</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Pair 3  Pre-SE – Post-SE</td>
<td>-4.87</td>
<td>8.17</td>
<td>1.47</td>
<td>-7.87</td>
<td>-1.87</td>
<td>-3.320</td>
<td>30</td>
<td>.002</td>
<td></td>
</tr>
</tbody>
</table>

As in the frequencies of teachers’ use of computers and teachers’ perceptions of their IT skills in the previous sections, it would be informative to look at the meaningfulness of the changes in self efficacy from the effect size calculations. Table 5.14 show the effect sizes of the changes between the three pairs.

From Table 5.14, the effect size of the change from before to one year of the study was 1.21 which was positive and extremely large, and from the first to the second year of the study was –0.49, which was medium but negative. The overall increase in teachers’ self-efficacy in using IT in teaching was 0.67 which was also moderately large and positive. Using Cohen’s guideline (1977), these values demonstrate that the effect of the increases from before the study to the end of the first year was extremely large and very meaningful, but the effect sizes of the decrease from the end of the first year to the end of the second year and the net increase from before the study to the end of the second year were both medium in magnitude, and moderately meaningful in effect revealed by the small number of participants.

Table 5.14
*Effect size of the changes of teachers’ self-efficacy in using IT in teaching.*

<table>
<thead>
<tr>
<th></th>
<th>Pre-SE</th>
<th>Mid-SE</th>
<th>Post-SE</th>
<th>Pre-SE – Mid-SE</th>
<th>Mid-SE – Post-SE</th>
<th>Pre-SE – Post-SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>30.68</td>
<td>39.06</td>
<td>35.55</td>
<td>8.38</td>
<td>-3.51</td>
<td>4.87</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>7.03</td>
<td>6.84</td>
<td>7.52</td>
<td>49.43</td>
<td>46.73</td>
<td>56.52</td>
</tr>
<tr>
<td>Variance</td>
<td>49.43</td>
<td>46.73</td>
<td>56.52</td>
<td>1.26</td>
<td>1.23</td>
<td>1.35</td>
</tr>
<tr>
<td>Pooled SD</td>
<td>6.93</td>
<td>7.19</td>
<td>7.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect Size</td>
<td>1.21</td>
<td>-0.49</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4.2 COMPARING THE MEANS AND PERCENTAGES OF TEACHERS’ SELF-EFFICACY IN USING IT IN TEACHING BY GENDER

Table 5.15

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean of each survey</th>
<th>Difference of Means between surveys</th>
<th>Percentage of Change between surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-SE Mid-SE Post-SE</td>
<td>Mid-Pre Post-Mid Post-Pre Mid-Pre Post-Mid Post-Pre</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>28.67 36.71 33.52</td>
<td>8.05 -3.19 4.86</td>
<td>28.07% -8.69% 16.94%</td>
</tr>
<tr>
<td>S.D.</td>
<td>6.590 6.612 7.613</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35.36 43.00 39.18</td>
<td>7.64 -3.82 3.82</td>
<td>21.59% -8.88% 10.80%</td>
</tr>
<tr>
<td>S.D.</td>
<td>6.120 5.273 5.582</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male-Female</td>
<td>6.69 6.29 5.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similar to the previous analysis on teachers’ perceptions of their IT skills, by comparing the differences of mean values and percentage changes of female and male teachers’ self-efficacy in using IT in teaching, Table 5.15 shows that female teachers had an increase in self-efficacy by 28.07% while male teachers had an increase of only 21.59% after one year of the study. Both genders had a similar drop of 8.69% and 8.88% respectively in the second year, the net change in perceptions of their self-efficacy in using IT in teaching over the two years of study was an increase of 16.94% in female teachers, and 10.80% in male teachers. The difference between the means of self-efficacy for male and female teachers decreased from 6.69 before the study, to 6.29 after one year, and 5.66 after two years. The decrease in the difference of means between the genders was not as big as the case of teachers’ perceptions of their own IT skills.

5.4.3 CROSS-TABULATION OF TEACHERS’ SELF-EFFICACY IN USING IT IN TEACHING BY GENDER

Table 5.16 shows that female teachers had lower self-efficacy in using IT in teaching than male teachers in general. Before the study, the majority of female teachers were within the range of 21 to 30 while the majority of male teachers were in the range of 31 to 40. After a year of intensive IT training sessions, trial teaching using IT and PAR meetings, there were large
improvements in teachers’ self-efficacy. Female teachers’ self-efficacy spread out and moved up one to two levels. Male teachers also moved up one to two levels, and the majority of male teachers were in the second highest range of 41 to 50. After the second year of teaching with IT and PAR meetings, the self-efficacy of female teachers dropped back one level, and nearly half of them were in the third highest level. There were also decreases in male teachers’ self-efficacy, and they were equally distributed in the second and third highest level. Comparing the movement of teachers’ self-efficacy, there was enhancement in general after two years of study.

Table 5.16
Cross-tabulation of teachers’ self-efficacy versus gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Self-efficacy</th>
<th>1-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-SE</td>
<td></td>
<td>5%</td>
<td>62%</td>
<td>33%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Mid-SE</td>
<td>29%</td>
<td>38%</td>
<td>29%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-SE</td>
<td></td>
<td>5%</td>
<td>29%</td>
<td>48%</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-SE</td>
<td></td>
<td>30%</td>
<td>60%</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Mid-SE</td>
<td>20%</td>
<td>70%</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-SE</td>
<td></td>
<td>50%</td>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.4.4 CORRELATION BETWEEN TEACHERS’ SELF-EFFICACY IN USING IT IN TEACHING AND AGE

As seen in Table 5.17, teachers’ self-efficacy was significantly negatively correlated with age at the .05 level in the first survey before the study, r(31) = -0.414, p<.05, but the correlation became insignificant in the second and third survey. It means that older teachers were significantly less efficacious than young teachers initially, but the differences of self-efficacy between young and old teachers decreased after the school-based IT training sessions and the PAR activities.

Table 5.17
Correlations between age and self-efficacies.

<table>
<thead>
<tr>
<th></th>
<th>SE before study</th>
<th>SE after 1 year</th>
<th>SE after 2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>-0.414*</td>
<td>-0.329</td>
<td>-0.319</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.021</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>
5.4.5 COMPARING THE MEANS AND PERCENTAGES OF TEACHERS’ SELF-EFFICACY IN USING IT IN TEACHING BY AGE GROUPS

Table 5.18
Comparing the means and percentages of teachers’ self-efficacy in using IT in teaching by age groups.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pre-SE Mean</th>
<th>Mid-SE Mean</th>
<th>Post-SE Mean</th>
<th>Pre-SE S.D.</th>
<th>Mid-SE S.D.</th>
<th>Post-SE S.D.</th>
<th>Pre-SE N</th>
<th>Mid-SE N</th>
<th>Post-SE N</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>34</td>
<td>41.55</td>
<td>38</td>
<td>6.71</td>
<td>6.65</td>
<td>7.67</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>31-40</td>
<td>35</td>
<td>37.5</td>
<td>33.75</td>
<td>4.55</td>
<td>6.19</td>
<td>9.11</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>41-50</td>
<td>28.11</td>
<td>39.11</td>
<td>36.67</td>
<td>5.21</td>
<td>7.82</td>
<td>6.14</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Over 50</td>
<td>26.29</td>
<td>36</td>
<td>31.29</td>
<td>7.78</td>
<td>5.94</td>
<td>7.52</td>
<td>9</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>30.68</td>
<td>39.06</td>
<td>35.55</td>
<td>7.03</td>
<td>6.84</td>
<td>7.52</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 5.18 shows the changes of self-efficacy in using IT in teaching of the four age groups. Older teachers had lower level of self-efficacy in using IT in teaching than younger teachers before the study. Age group five has the largest increase in mean value while group four had the smallest increase after a year of intensive IT training, trial teaching and PAR activities. After the second year of PAR activities, all four groups reported a drop in self-efficacy. Age group five reported the smallest drop while age group six reported the largest drop. When compared with the self-efficacy before the study and at the end of the study, groups three, five and six reported an enhancement of two digit percentage increase while group four reported a drop of 3.6%.

5.4.6 CROSS-TABULATION OF TEACHERS’ SELF-EFFICACY AND AGE GROUPS

Similar to the patterns of the cross-tabulation of teachers’ perceptions of their IT skills, Table 5.19 shows an increase in self-efficacy for all age groups after the intervention in the first year. Though there were decreases in self-efficacy in the second year, there was net increase in self-efficacy in the two years of study.
Table 5.19
Cross-tabulation of teachers’ self-efficacy and age.

<table>
<thead>
<tr>
<th>Age</th>
<th>SE</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-55</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3: 21-30</td>
<td>Pre-SE</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mid-SE</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-SE</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4: 31-40</td>
<td>Pre-SE</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mid-SE</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-SE</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5: 41-50</td>
<td>Pre-SE</td>
<td>7</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mid-SE</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-SE</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6: Over 50</td>
<td>Pre-SE</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mid-SE</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-SE</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.4.7 CORRELATIONS BETWEEN SELF-EFFICACY AND PERCEPTIONS OF THEIR OWN IT SKILLS, AND FREQUENCY OF USE OF COMPUTERS

From teachers’ reported data on self-efficacy, perceptions of their own IT skills, and frequency of use of computers, it was found that self-efficacy is significantly correlated to teachers’ perceptions of their own IT skills at .01 level in the three surveys, as shown in Table 5.20. It means that teachers more knowledgeable in using IT will become more efficacious in using IT in teaching. So it is necessary for teachers to have opportunities to acquire the knowledge and master the skills and techniques in order to teach confidently with IT. It is also found that self-efficacy is significantly correlated at .01 level with teachers’ frequency of use of computers in the first and last surveys. Efficacious teachers use computers more often.

Table 5.20
Correlations between self-efficacy and perceptions of IT skills, and frequency of use of computers.

<table>
<thead>
<tr>
<th></th>
<th>Pre-ITS</th>
<th>Mid-ITS</th>
<th>Post-ITS</th>
<th>Pre-Freq</th>
<th>Mid-Freq</th>
<th>Post-Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-SE</td>
<td>0.713**</td>
<td>0.576**</td>
<td>0.508**</td>
<td>0.659**</td>
<td>0.289</td>
<td>0.548**</td>
</tr>
<tr>
<td>Mid-SE</td>
<td>0.482**</td>
<td>0.676**</td>
<td>0.531**</td>
<td>0.366*</td>
<td>0.219</td>
<td>0.569**</td>
</tr>
<tr>
<td>Post-SE</td>
<td>0.466**</td>
<td>0.366*</td>
<td>0.605**</td>
<td>0.251</td>
<td>0.115</td>
<td>0.461**</td>
</tr>
</tbody>
</table>
5.4.8 CONCLUSION ON TEACHERS’ SELF-EFFICACY IN USING IT IN TEACHING

From Table 5.13 and 5.14, the t-value and the effect size of the change in the means of teachers’ self-efficacy in using IT in teaching were very large after the intervention, which indicated a very large increase and meaningful change in the average value of teachers’ self-efficacy. Both genders had a big percentage increase, and the increase of female teachers was a little higher. Male teachers’ mean self-efficacy in using IT in teaching was higher than that of the female teachers but the difference became smaller as the study progressed. There was a significant decrease both in the mean self-efficacy and the perceptions of their own IT skills in the second year where teachers of both genders had similar drops. However, despite the decrease, the overall increase of teachers’ self-efficacy in using IT in teaching from before the study to the end of two years was still significant. The results follow similar patterns of teachers’ frequency of use of computers and perceptions of their own IT skills. Table 5.20 confirms the similarity by showing that teachers’ self-efficacy in using IT in teaching is significantly correlated to teachers’ perceptions of their own IT skills and their frequency of use of computers. Thus it is necessary for teachers to learn more about IT and IT in teaching in order to enhance their self-efficacy. It also agrees with Bandura’s (1977b) theory that efficacious teachers will use IT more often.

5.5 NUMBERS OF STRATEGIES, PERIODS AND WEEKS INCORPORATING IT IN TEACHING

The following section constitutes the second part of the chapter. Teachers were requested to fill in the number of strategies incorporating IT in their teaching in each lesson on a pre-printed timetable (See Appendix D) as the record of their participation in the action research activities. They were requested to hand the timetable to the IT Coordinator who collected them and gave them to the researcher weekly in the first year, and by fax to the researcher weekly in the second year. The codes for each strategy used, class and subject in which the strategy was used, and the teacher using the strategy, were recorded. Teachers using multiple strategies were recorded separately as different entries. The average numbers of strategies, periods and weeks used in teaching incorporating IT by teachers per week and per teacher over 25 weeks
in the first year and over 32 weeks in the second years, and the standard deviations for each year, the differences of the means of strategies, periods and weeks and the percentage changes over the two years are shown in Tables 5.21, 5.23 and 5.25 respectively, and the significance of the differences were evaluated by t-test. Here the number of strategies, periods and weeks of the Computer Literacy subject were not included because in teaching Computer Literacy it is mandatory to use IT in teaching as far as possible.

5.5.1 NUMBERS OF STRATEGIES INCORPORATING IT IN TEACHING

In this section, the means of the strategies incorporating IT used by teachers in teaching per teacher per week and the difference of these means as well as the percentage changes in these means are presented. The statistical significance of the change is examined by t-test, and the meaningfulness of the change revealed by the data set is examined by the effect size calculations.

5.5.1.1 DESCRIPTIVE STATISTICS OF THE NUMBERS OF STRATEGIES INCORPORATING IT IN TEACHING OVER THE TWO YEARS

From Table 5.21, the average number of strategies incorporating IT in teaching in 2000-01 was 1.47 per teacher per week and that of the year 2001-02 was 1.86 per teacher per week. The difference of the means reported over these two years was 0.39 per teacher per week, which was a 26.4% increase in the average number of strategies incorporating IT in teaching used in subjects other than Computer Literacy from the first year from 2000 to 2001 to the second year from 2001 to 2002.

<table>
<thead>
<tr>
<th></th>
<th>2000-01</th>
<th>2001-02</th>
<th>Difference of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=31 Mean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St./Teacher/Week</td>
<td>1.474</td>
<td>1.178</td>
<td>1.862</td>
</tr>
<tr>
<td>S. D. Mean</td>
<td>1.178</td>
<td>1.862</td>
<td>1.343</td>
</tr>
<tr>
<td>S. D. Difference</td>
<td>0.388</td>
<td></td>
<td>26.4%</td>
</tr>
<tr>
<td>Percent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.5.1.2 T-TEST OF THE CHANGE IN NUMBERS OF STRATEGIES INCORPORATING IT IN TEACHING OVER TWO YEARS

From Table 5.22, by comparing the mean values of strategies incorporating IT in teaching per teacher in the first and the second year, \( t(30) = \)
-3.28, p < .01. There was significant difference between the two means. However, there were 25 weeks in the first year and 32 weeks in the second year of timetable reports respectively, by comparing the increase in the number of strategies incorporating IT in teaching per teacher per week from the first year to the second year, $t(30) = -1.68, p = .104$, the difference per teacher per week was not significant.

When teachers first tried to incorporate IT in teaching, many of them tried using many strategies in one lesson. The average number of strategies incorporating IT in teaching in the first year from 2000 to 2001 was 3.86 strategies per period per teacher. However, in the second year from 2001-2002 there were only 2.09 strategies per period per teacher, nearly half the number in the previous year (See Table J.4 in Appendix J). Teachers in general used fewer numbers of strategies incorporating IT in one lesson but used them in more lessons.

From the analysis, two points can be concluded. One is that the average number of strategies per teacher per week had increased, though not significantly (Table 5.33). It means that teachers used more strategies when sustaining their use of strategies incorporating IT in teaching in the second year. The second point is that, when IT is integrated into teaching, sheer counting of strategies is not as meaningful as counting how many periods in which teachers used strategies incorporating IT because when teachers integrate IT into teaching, the strategies work together as a whole (Sandholtz et al., 1997). The change of the average number of periods per teacher per week over the two year period is examined in the next section.

Table 5.22
*Paired samples test of strategies incorporating IT in teaching per teacher and per teacher per week.*

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Strategies per teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Std. Dev.</td>
<td>Mean</td>
<td>Std. Error</td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#Str1 - #Str2</td>
<td>-22.740</td>
<td>38.630</td>
<td>6.940</td>
<td>-36.910</td>
<td>-8.570</td>
<td>-3.278</td>
</tr>
<tr>
<td>per week</td>
<td>-0.388</td>
<td>1.290</td>
<td>0.232</td>
<td>-0.862</td>
<td>0.085</td>
<td>-1.676</td>
</tr>
</tbody>
</table>
5.5.2 NUMBER OF PERIODS WHERE IT WAS INCORPORATED IN TEACHING

In this section, the average numbers, the difference of the two means, and the percentage change of periods per teacher per week where IT was incorporated in teaching, in 2000-01 and 2001-02, are shown in Table 5.23, and the proportion of the periods actually used IT in teaching compared with the maximum number of periods available for each teacher is examined in the following section and summarised in Table J.4 of Appendix J. The significance of the change is examined by t-test as shown in Table 5.24 and the meaningfulness of the change on a relatively small data size by effect size calculations in Table 5.23.

5.5.2.1 DESCRIPTIVE STATISTICS OF THE NUMBERS OF PERIODS WHERE IT WAS INCORPORATED IN TEACHING OVER TWO YEARS

From Table 5.23, the average number of periods where IT was incorporated in teaching in 2000-01 was 0.38 per teacher per week and that of the year 2001-02 was 0.93 per teacher per week. The difference in the means reported over these two years was 0.54 per teacher per week, which was a 142% increase of average numbers of periods where IT was incorporated in teaching subjects other than Computer Literacy from the first year from 2000 to 2001 to the second year from 2001 to 2002.

Table 5.23
Related measures in the change in number of periods.

<table>
<thead>
<tr>
<th>N=31</th>
<th>2000-01</th>
<th>2001-02</th>
<th>Difference of Means</th>
<th>Effect Size Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Periods</td>
<td>0.3832</td>
<td>0.2544</td>
<td>0.9264</td>
<td>0.5526</td>
</tr>
</tbody>
</table>

5.5.2.2 T-TEST OF THE CHANGE IN NUMBERS OF PERIODS WHERE IT WAS INCORPORATED IN TEACHING OVER TWO YEARS

From Table 5.24, \( t(30) = -5.205, p<.01 \). The increase in the total number of periods where IT was incorporated in teaching per teacher per week from the first year to the second year was significant at the .01 level. The effect size of the increase was 1.263, according to Cohen’s (1977) guideline, the effect of the change was extremely large, i.e., though the data set was small, the significance of the change among the two means revealed from these data was extremely meaningful.
Table 5.24
Paired samples test of periods.

<table>
<thead>
<tr>
<th>Number of Periods incorporating IT in Teaching per Teacher per Week</th>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periods1 - Periods2</td>
<td>-0.539</td>
<td>0.577</td>
<td>0.104</td>
<td>-0.751</td>
<td>-0.328</td>
<td>-5.205</td>
<td>30</td>
<td></td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

5.5.2.3 PROPORTION OF PERIODS WHERE IT WAS INCORPORATED IN TEACHING

In the following calculation, as it involves the total number of periods during the week, all 40 teachers were used instead of the 31 selected teachers. There was one computer room and one Multimedia Language Centre (MMLC), and there were 9 periods per day for a five-day week, the total number of periods available for using computers in the computer room or MMLC was $2 \times 9 \times 5 = 90$. However, there were 3 periods on the master timetable set aside for meetings and special functions, the total number of periods available in the computer room & MMLC was $90 - 3 \times 2 = 84$. Since there were 24 classes in 2000-01, each class had one period of Computer Literacy, so 24 periods were scheduled for Computer Literacy. The librarian also booked the room for his library classes to read electronic books. Assuming half of his classes used the computer room or MMLC, $12 + 24 = 36$ periods were thus scheduled for Computer Literacy and library classes, leaving only $84 - 36 = 48$ for teachers of other subjects to use the computer room or MMLC. There were 40 teachers in 2000-2001, and the average workload of a teacher was 31.15, the total number of periods was 1246. The maximum percentage of periods the computer room or MMLC were available for teaching with IT was $48 \div 1246 = 3.85\%$.

There was a total of 297 periods incorporating IT in teaching in 25 weeks by 31 teachers in the first year. The average number of periods per teacher was 9.58, and the average number of periods per teacher per week was 0.383. Since each teacher had an average teaching load of 31.15 per week, the percentage of periods where teachers actually used IT in teaching in the computer room or MMLC was $0.383 \div 31.15 = 1.23\%$. The proportion of the percentage of periods used in the computer room or MMLC compared with the maximum
percentage was \( \frac{1.23\%}{3.85\%} = 31.94\% \) in the first year.

In the second year, there were only 23 classes. The number of periods the computer room and MMLC were available was \( 90 - 3 \times 2 - 23 \times 12 = 49 \). Teachers’ teaching load had reduced to 28.76. For 40 teachers, the total number of periods was 1150. The maximum percentage of periods the computer room or MMLC were available for teaching with IT was \( \frac{49}{1150} = 4.26\% \).

There was a total of 919 periods incorporating IT in teaching by 31 teachers in 32 weeks. The number of periods per teacher per week was \( \frac{919}{31} \div 32 = 0.926 \). The percentage of periods where teachers actually used IT in teaching in the computer room and MMLC in the second year was \( \frac{0.926}{28.76} = 3.22\% \). The proportion of the percentage of periods actually used in the computer room or MMLC compared with the maximum percentage was \( \frac{3.22\%}{4.26\%} = 75.63\% \).

The calculations above assumed that teachers used the computer room and MMLC only. There were three classrooms, one on each floor, equipped with a computer and a data projector. However, since teachers could not access the Internet due to the poor connection of the network, the computers were older models which often did not work properly, and the support by the technician was not as much as in the computer room or MMLC, they usually preferred to use the computer room and MMLC, except those who were highly competent in using computers and was confident enough to fix any potential problems. In the second year 2001-02, there were still three classrooms with a computer and a data projector, one on each floor. The computers were more reliable and on the network. Teachers were more confident to use these classrooms. But for easy comparison, all teaching incorporating IT was assumed to take place in the computer room or MMLC. This showed an indicative proportion which could shed light on the proportion of change. Detailed calculation can be referred to Table J.5 in Appendix J.

With these statistical methods, a confident claim can be made that there was a significant increase in the average number of periods where IT was incorporated in teaching per teacher per week over the period of the study. There was a change in the proportion of lessons involving IT from 31.94% in
the first year to 75.63% in the second year, which was 237% of the first year.

5.5.3 NUMBER OF WEEKS WHERE IT WAS USED IN TEACHING

In this section, the average numbers, the difference in the two means, and the percentage of change of weeks per teacher per week where IT was incorporated in teaching, in 2000-01 and 2001-02, are shown in Table 5.25 and examined. The significance of the change is examined by t-test as shown in Table 5.26, and the meaningfulness of the change by the effect size as shown in Table 5.25.

5.5.3.1 DESCRIPTIVE STATISTICS OF THE NUMBERS OF WEEKS WHERE IT WAS INCORPORATED IN TEACHING OVER TWO YEARS

Table 5.25 demonstrates that the average number of weeks where IT was incorporated in teaching in 2000-01 was 0.250 per teacher per week and that in the year 2001-02 was 0.487 per teacher per week. The difference of the means reported over these two years was 0.237 per teacher, which was a 94.5% increase of average numbers of weeks where IT was incorporated in teaching subjects other than Computer Literacy from the first year from 2000 to 2001 to the second year from 2001 to 2002.

Table 5.25

<table>
<thead>
<tr>
<th>N=31</th>
<th>2000-01</th>
<th>2001-02</th>
<th>Difference of Means</th>
<th>Effect Size Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Weeks</td>
<td>0.2503</td>
<td>0.1623</td>
<td>0.4869</td>
<td>0.2039</td>
</tr>
</tbody>
</table>

5.5.3.2 T-TEST OF THE CHANGE IN NUMBERS OF WEEKS WHERE IT WAS INCORPORATED IN TEACHING OVER TWO YEARS

From Table 5.26, \( t(30) = -6.269, p<.01 \). The increase in the number of weeks where IT was incorporated in teaching from the first year to the second year was significant at the .01 level. The effect size of the increase was 1.284, according to Cohen’s (1977) guideline, the effect of the change was extremely large, i.e., although the data set was small, the significance of the change among the two means revealed from these data was extremely meaningful.
Table 5.26

*Paired samples test of weeks.*

<table>
<thead>
<tr>
<th>No. of Weeks per Teacher per Week</th>
<th>Paired Differences</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wk1 - Wk2</td>
<td>-0.237</td>
<td>0.210</td>
<td>-0.314 -0.160</td>
<td>-6.269</td>
<td>30</td>
<td>0.000</td>
</tr>
</tbody>
</table>

5.5.4 CONCLUSION ON DATA OBTAINED FROM TIMETABLE REPORTS

From the results presented above, teachers used more strategies incorporating IT in teaching in the second year although the increase per teacher per week was not statistically significant. The number of strategies per period dropped to slightly more than half of the previous year (2.01/3.85=52%). The number of strategies incorporating IT in teaching per teacher per week dropped from 0.155 in the first year to 0.065 in the second year when it was averaged over 31 teachers and different numbers of weeks of timetable report. There was a drop of 42% in the second year. Teachers used fewer strategies per lesson, but since there were more lessons incorporating IT in teaching in the second year as explained below, there was an increase in the total number of strategies.

As IT was integrated into teaching, the number of periods incorporating IT in teaching became an important indication of the integration. There was a significant increase in the number of periods incorporating IT in teaching per teacher per week, from 0.383 in the first year to 0.926 in the second year, which was 141.7%. The proportion of the number of periods incorporating IT in teaching to the number of periods available for use in the computer room and MMLC rose also from 31.94% to 75.63%, which was an increase of 136.8%. This is further evidence that teachers have increased their incorporation of IT in their teaching.

The average number of weeks where there were lessons incorporating IT in teaching per teacher per week also increased significantly at the 0.01 level, from 0.250 in the first year to 0.487 in the second year which was a 94.5% increase. As the number of weeks was limited by the duration of timetable report, the increase in weeks incorporating IT in teaching could not match that of periods. The ratio changed from 1.53 periods per week in the first year to
1.90 per week in the second year. The significant increase in weeks indicated that teachers used IT in more lessons, and the lessons spread out in more weeks, suggesting that teachers used IT more often, more selectively and when the application was more appropriate.

As an indication of the success of the intervention on teachers’ use of IT in teaching, the results of the study are compared with another study in 1999/2000 (Ngan & Lee, 2002). The mean frequency of the use of IT of 66 schools and 1457 teachers was found to be 4.73 times within an academic year. The mean frequency of the 31 teachers in 2000-01 was 38.84 strategies per teacher in 25 weeks and in 2001-02 was 59.58 strategies per teacher in 32 weeks. The mean periods incorporating IT in teaching in 2000-01 was 9.58 periods in 25 weeks and in 2001-02 was 29.65 periods per teacher in 32 weeks. Much higher values were recorded from teachers’ timetable reports (Table J.8, Appendix J). In the same study, it was found that 36.5% reported never used IT in their teaching, 30% used one to five times, 7.2% for six to ten times, 8.3% for more than 11 times, and 18% did not answer (Ngan & Lee, 2002). In this study, in 2000-01, 3.23% teachers used one to five strategies, 12.9% used six to ten strategies, and 83.7% used more than 11 strategies; in 2001-02, no teacher reported used less than six strategies, 6.45% used six to ten strategies, and 93.55% used more than 11 strategies. If period is considered instead of strategies, in 2000-01, 29.03% reported incorporated IT in one to five periods, 38.71% in six to ten periods, and 32.26% in more than 11 periods, while in 2001-02, only 6.45% teachers reported incorporated IT in one to five periods, 3.23% in six to ten periods, and 90.32% in more than 11 periods (Table J.9, Appendix J). Although there was a difference of one year in time, but the differences in the percentages of teachers using IT were so big that teachers in the school under study did make huge progress with respect to incorporating IT in teaching compared with the 1457 teachers from 66 schools in Ngan and Lee’s study.
Table 5.27

Comparison of IT strategies used in teaching between 1457 teachers from 66 schools and those at Philanthropy Primary School.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean # strategies per year</td>
<td>4.73</td>
<td>38.84</td>
<td>59.58</td>
</tr>
<tr>
<td>Never used</td>
<td>36.5%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Did not answer</td>
<td>18%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 – 5 strategies</td>
<td>30%</td>
<td>3.23%</td>
<td>0</td>
</tr>
<tr>
<td>6 – 10 strategies</td>
<td>7.2%</td>
<td>12.9%</td>
<td>6.45%</td>
</tr>
<tr>
<td>More than 11 strategies</td>
<td>8.3%</td>
<td>83.7%</td>
<td>93.55%</td>
</tr>
<tr>
<td>Mean # periods per year</td>
<td>9.58</td>
<td>29.65</td>
<td>93.55%</td>
</tr>
<tr>
<td>1 – 5 periods</td>
<td>29.03%</td>
<td>6.45%</td>
<td>6.45%</td>
</tr>
<tr>
<td>6 – 10 periods</td>
<td>38.71%</td>
<td>3.23%</td>
<td>3.23%</td>
</tr>
<tr>
<td>More than 11 periods</td>
<td>32.26%</td>
<td>60.32%</td>
<td>60.32%</td>
</tr>
</tbody>
</table>

According to a survey conducted by the City University Professional Consultancy Limited, which sent questionnaires to all the primary and secondary schools, and received returns from 152 primary and secondary schools in 2002-2003, the average time incorporating IT in teaching by teachers of these schools was less than 5% (Singtao Education News, 2003a). The average percentage of time incorporating IT in teaching by teachers in the current study was found to be only 5.28% (Table J10, Appendix J). Although it was far lower than the value stipulated by the EMB, this value can be regarded as quite good because the City University research was conducted one year later, with more resources and the infrastructure of the schools would be better. Thus there was evidence that, after the training sessions in the first year, and the PAR activities in both years, teachers used a lot more IT in their teaching of different subjects in the second year. They had changed their practice from the usual chalk-and-talk approach to using IT in assisting their teaching.

As the teachers increased the number of strategies, periods and weeks incorporating IT in teaching, the frequency of use of computers would increase accordingly. So the significant increase in the frequency of teachers’ use of computers is a natural consequence of teachers’ increase in their use of IT in teaching.

The results inform indicator four: What are the changes in teachers’ practice”. Teachers had increased the number of strategies incorporating IT in teaching in many more lessons over more periods of time. They had changed from the traditional chalk and talk into teaching incorporating IT after they
attended the training sessions and the PAR activities.

5.6 TEACHERS' PRACTICE USING IT IN TEACHING

After seeing the changes in terms of the strategies, periods and weeks in which teaching was incorporating with IT, it is time to turn to the individual strategy to inform indicators three: “What are the teachers’ common strategies in using IT in their teaching” and four: “What are the changes in teachers’ practice”,

5.6.1 PERCENTAGES OF STRATEGIES INCORPORATING IT IN TEACHING EMPLOYED BY TEACHERS IN THE TWO YEARS

The timetable reports provided detailed information on the strategies incorporating IT in teaching employed by teachers in the classes, periods and weeks. This section provides a profile of the proportions of strategies used throughout the year and identifies the popular strategies for further discussion. For easy reference, the codes for the strategies were listed in Table 5.28:

Table J.6 in the Appendix J shows that the popular strategies incorporating IT in teaching used by teachers in the first year 2000-01 were S1: Presentation by teacher (16.81%), S3: Motivation (16.20%), S4: Explanation (14.10%) and S6: Creating Learning Environment (14.36%). There were many teachers who asked students to help control the presentation (S2, 9.89%). The total number of presentation (S1+S2) made up a large proportion of the number of strategies incorporating IT in teaching used in the first year (26.70%).

Table 5.28
Codes for strategies incorporating IT in teaching.

<table>
<thead>
<tr>
<th>Code</th>
<th>Strategy</th>
<th>Code</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Presentation controlled by teacher</td>
<td>S14</td>
<td>Get information through IT</td>
</tr>
<tr>
<td>S2</td>
<td>Presentation controlled by students</td>
<td>S15</td>
<td>Collaborative knowledge building</td>
</tr>
<tr>
<td>S3</td>
<td>Motivation tool</td>
<td>S16</td>
<td>Using VCD</td>
</tr>
<tr>
<td>S4</td>
<td>Explanation tool</td>
<td>S17</td>
<td>Using Projector</td>
</tr>
<tr>
<td>S5</td>
<td>Education TV</td>
<td>S18</td>
<td>Web resources/Internet</td>
</tr>
<tr>
<td>S6</td>
<td>Create Learning Environment</td>
<td>S19</td>
<td>Using visualiser</td>
</tr>
<tr>
<td>S7</td>
<td>Remedial teaching</td>
<td>S20</td>
<td>Cassette/CD/Video Player/TV</td>
</tr>
<tr>
<td>S8</td>
<td>Reward for accomplished early</td>
<td>S21</td>
<td>Quiz using IT</td>
</tr>
<tr>
<td>S9</td>
<td>Rotate group work</td>
<td>S22</td>
<td>Consolidate knowledge learned</td>
</tr>
<tr>
<td>S10</td>
<td>Small groups, same job</td>
<td>S23</td>
<td>Evaluate students’ ability</td>
</tr>
<tr>
<td>S11</td>
<td>Working in the computer room</td>
<td>S24</td>
<td>Assessment</td>
</tr>
<tr>
<td>S12</td>
<td>Project development</td>
<td>S25</td>
<td>Revision</td>
</tr>
<tr>
<td>S13</td>
<td>Project presentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the second year, ETV programs in CD-ROM format were readily available. There was an increase in the number of teachers using them in their teaching (S5, 17.27%). S6 to create a learning environment (12.67%) and S4 to use IT as explanation tool (14.67%) remained popular, but presentations controlled by teachers (S1, 8.39%) and students (S2, 3.79%), and S3 using IT as motivation tool (10.07%) dropped drastically. Teachers also experimented with different ways of using IT in teaching and extended the list of strategies from 15 to 25. Many teachers used VCD (S16) and CD or cassette tapes (S20) from the publishers in various subjects. The result was an overall increase in the total number of strategies incorporating IT in teaching used in the second year, as confirmed previously in section 5.5.1. Teachers used IT mainly as an additional tool to arouse students’ interest, to motivate them to listen, and to help the teachers in explaining the facts to students using ETV, CD-ROM and the Internet in a teacher-centred paradigm. Similar to the findings of Cuban (2001), the overwhelming majority of teachers use IT as an additional tool in their customary set of teaching practices to sustain existing patterns of teaching. Teachers in the school often expressed their belief that using IT in teaching is multidimensional, giving students multi-sensory stimuli to help them understand the content. Although the hardware remained more or less the same in number, the computers in the classroom were replaced by some newer models. The software or teaching resources were more readily available, hence more teachers would try using IT in teaching. But resources and facilities alone may not be able to motivate those teachers who are not confident and competent in using IT to use them because using IT involves knowledge and skills. After the 18 training sessions with hands-on tasks to gain performance experience (Bandura, 1977b), and trial teachings under the support of IT Team members, teachers became more confident in using IT in teaching. When restrictions by resources were lifted, teachers tended to use more, albeit the paradigm was still mainly teacher-centred.

However, there were some teachers who showed changes in teaching approach. They helped students to learn independently by asking students to get information through IT such as CD-ROM, Internet and web resources, to develop projects and present them in the class. From the timetable reports,
there were only six teachers asking students to do projects using IT and two asked them to present their projects using IT in the first year, there were ten teachers giving projects using IT and four asking students to present their projects using IT in the second year. These and other teachers may be constrained by the insufficient number of computers available for students to work (Section 4.3.2.1), and students’ poor abilities to collect information, make queries, write out reports (Section 8.6.2.2), they were still trying to shift to the new paradigm of teaching. There were incremental changes (Cuban, 2001) in numbers from six to ten in giving projects and two to four in asking students to present their projects, but the percentages were big increases of 67% and 100%.

5.6.2 SUBJECTS WHERE IT WAS INCORPORATED IN TEACHING

Teachers not only used more strategies, periods and weeks incorporating IT in teaching, they also incorporating IT in all subject offered by the school. It is natural for computer teachers to use IT or computers in their teaching, so the subject was excluded from the calculations. From Table J.10, the subjects which used more IT were the Chinese and English languages. There were large percentage increases in subjects which IT was not used much in the first year, such as Putonghua (Mandarin, increased from 17 to 79, and the percentage increase was \((79 - 17) \div 17 \times 100\% = 365\%)\), Tutorial (increased from 8 to 31, percentage increase = 288%), English (increased from 262 to 635, percentage increase = 142%), General Studies (from 187 to 390, 109%), Music (from 44 to 82, 86%), Chinese (from 289 to 478, 65%) and Mathematics (from 214 to 299, 39.72%). Art, Bible Study, Computer and Physical Education recorded drops in the number of strategies incorporating IT in teaching, but their numbers were relatively small (Table J.10). There were the same numbers of computers in the MMLC and computer room, and the number of classrooms with computers in the two years. Teachers had developed a tendency to incorporating IT in teaching after the training sessions and PAR activities, so when more software and IT-based teaching materials were available, they would increase their frequency of using IT in teaching.

5.6.3 CORRELATIONS BETWEEN STRATEGIES

Some strategies incorporating IT in teaching were found to correlate to
one another significantly. Table 5.29 shows the correlation coefficients between strategies one to six.

Table 5.29

<table>
<thead>
<tr>
<th></th>
<th>N=31</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1</td>
<td>0.499**</td>
<td>0.347</td>
<td>0.365*</td>
<td>0.036</td>
<td>0.43*</td>
<td>0.381*</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>0.499**</td>
<td>1</td>
<td>0.104</td>
<td>0.094</td>
<td>-0.017</td>
<td>0.297</td>
<td>0.508**</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>0.347</td>
<td>0.104</td>
<td>1</td>
<td>0.889**</td>
<td>-0.069</td>
<td>0.783**</td>
<td>0.161</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>0.365*</td>
<td>0.094</td>
<td>0.889**</td>
<td>1</td>
<td>0.027</td>
<td>0.683**</td>
<td>0.071</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>0.036</td>
<td>-0.017</td>
<td>-0.069</td>
<td>0.027</td>
<td>1</td>
<td>-0.05</td>
<td>-0.044</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>0.43*</td>
<td>0.297</td>
<td>0.783**</td>
<td>0.683**</td>
<td>-0.05</td>
<td>1</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>0.381*</td>
<td>0.508**</td>
<td>0.161</td>
<td>0.071</td>
<td>-0.044</td>
<td>0.34</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

5.6.3.1 CORRELATIONS OF STRATEGIES ONE TO SIX

From Table 5.29, S1: Presentation controlled by teacher, correlated significantly at a confidence level of .01 with S2: Presentation controlled by students, and at the .05 level with S4: Explanation, S6: Creating Learning Environment, and S7: Remedial teaching in the first year’s timetable reports. It suggests that teachers who used S1 more would also used S2 more, with significant Pearson correlation coefficient at 0.1 level, and S4, S6 and S7 more, with significant Pearson correlation coefficients at 0.5 level in the first year.

In the second year, however, strategy S1 was highly correlated with strategy four with Pearson correlation coefficient at 0.1 level. But the correlations between S1 and S6 and S7 were no longer significant in the second year.
5.6.3.2 CORRELATION BETWEEN STRATEGIES THREE AND FOUR

The data in Table 5.29 shows the correlations between S3: Motivation, S4: Explanation and S6: Creating Learning Environment at the same time. The coefficients between S3 and S4, S3 and S6, and S4 and S6 were 0.889**, 0.783**, and 0.683** in the first year, and 0.890**, 0.748**, and 0.748** in the second years respectively.

The analysis demonstrates that teachers using IT as an additional tool in existing pattern of teaching used a group of strategies S3, S4, S6 together.

5.6.3.3 CORRELATION BETWEEN IT STRATEGIES THREE, FOUR, SIX AND AGE

Table 5.30 shows that the correlations between age and S1, S3, S4 and S6 for the two years, many of which were significant at the .05 level. It means that older teachers used more S1, S3, S4 in the first year and S3, S4 and S6 in the second year than younger teachers.

Table 5.30
Correlations between age and IT teaching strategies in two years

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2000-2001</td>
<td>2001-2002</td>
<td></td>
</tr>
<tr>
<td>Pearson</td>
<td>Correlation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>0.372*</td>
<td>0.363*</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>0.434*</td>
<td>0.428*</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>0.377*</td>
<td>0.443*</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>0.236</td>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.039</td>
<td>0.015</td>
<td></td>
<td></td>
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<tr>
<td>0.037</td>
<td>0.202</td>
<td></td>
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<tr>
<td>0.286</td>
<td>0.045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.045</td>
<td>0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

5.6.4 TEACHERS USING MORE STUDENT-CENTRED APPROACH

As mentioned in Section 5.6.1 the majority of teachers used IT as an additional tool to arouse students’ interest and motivate them to listen to the teaching, and to help with explaining the content by videos, graphics and sound, which was confirmed by the correlations in sections 5.6.2 to 5.6.3. There were some teachers who did change their practice to capitalize on using IT in teaching by giving students more opportunity to take active study by doing and presenting projects, and to get information from the Internet. Table 5.31 shows that teachers using S12 tended to use S10, S13, S14, S15 and S16 more in the first year, and those used S12 and S13 tended to use S10, S14 and S15 more. The correlations were at the .01 level in the first year. The correlations in the
second year dropped a little so that S10 was at the .05 level, but the other correlations were still at .01 level. By examining the data in the original timetables, it was found that teachers using S10, S12, S13, S14, S15, and S16 more were those who used more strategies incorporating IT in their teaching.

Table 5.31

<table>
<thead>
<tr>
<th></th>
<th>S10</th>
<th>S12</th>
<th>S13</th>
<th>S14</th>
<th>S15</th>
<th>S16</th>
</tr>
</thead>
<tbody>
<tr>
<td>S10</td>
<td>1</td>
<td>0.743**</td>
<td>0.792**</td>
<td>0.803**</td>
<td>0.905**</td>
<td>0.684**</td>
</tr>
<tr>
<td>S12</td>
<td>0.743**</td>
<td>1</td>
<td>0.481**</td>
<td>0.795**</td>
<td>0.889**</td>
<td>0.444*</td>
</tr>
<tr>
<td>S13</td>
<td>0.792**</td>
<td>0.481**</td>
<td>1</td>
<td>0.629**</td>
<td>0.793**</td>
<td>0.898**</td>
</tr>
<tr>
<td>S14</td>
<td>0.803**</td>
<td>0.795**</td>
<td>0.629**</td>
<td>1</td>
<td>0.827**</td>
<td>0.473**</td>
</tr>
<tr>
<td>S15</td>
<td>0.905**</td>
<td>0.889**</td>
<td>0.793**</td>
<td>0.827**</td>
<td>1</td>
<td>0.735**</td>
</tr>
<tr>
<td>S16</td>
<td>0.684**</td>
<td>0.444*</td>
<td>0.898**</td>
<td>0.473**</td>
<td>0.735**</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>S10</th>
<th>S12</th>
<th>S13</th>
<th>S14</th>
<th>S15</th>
<th>S16</th>
</tr>
</thead>
<tbody>
<tr>
<td>S10</td>
<td>1</td>
<td>0.396*</td>
<td>0.392*</td>
<td>0.306</td>
<td>0.317</td>
<td>0.196</td>
</tr>
<tr>
<td>S12</td>
<td>0.396*</td>
<td>1</td>
<td>0.638**</td>
<td>0.636**</td>
<td>0.331</td>
<td>0.131</td>
</tr>
<tr>
<td>S13</td>
<td>0.392*</td>
<td>0.638**</td>
<td>1</td>
<td>0.609**</td>
<td>0.617**</td>
<td>0.216</td>
</tr>
<tr>
<td>S14</td>
<td>0.306</td>
<td>0.636**</td>
<td>0.609**</td>
<td>1</td>
<td>0.375*</td>
<td>0.07</td>
</tr>
<tr>
<td>S15</td>
<td>0.317</td>
<td>0.331</td>
<td>0.617**</td>
<td>0.375*</td>
<td>1</td>
<td>0.386*</td>
</tr>
<tr>
<td>S16</td>
<td>0.196</td>
<td>0.131</td>
<td>0.216</td>
<td>0.07</td>
<td>0.386*</td>
<td>1</td>
</tr>
</tbody>
</table>

5.6.5 CONCLUSION ON TEACHERS’ STRATEGIES INCORPORATING IT IN TEACHING

The results presented in the above sections inform indicator three that the common strategies incorporating IT in teaching were S1, S3, S4, S6 and S2 in the first year and S5, S4, S6, S3, S1 and S20 in the second year. More teachers tried using presentation software controlled by themselves or their students in the first year, but the number decreased in the second year. Using IT as an explanation tool remained high in the two years while using IT as motivation tool was popular in the first year and the popularity dropped in the second year. In general, teachers who used IT as explanation tool would also use IT as motivation tool. Older teachers used IT to create a learning environment and as motivation and explanation tools more than younger teachers. However, these strategies were used in a teacher-centred approach, using IT as an aid to help teachers deliver teaching contents to the students. There were some attempts to
change the teaching practice to a more student-centred approach by using IT for project development and presentation. Although the percentages were small and there was also a decrease in the number of these strategies used in the second year, the number of teachers using these strategies doubled. The results inform indicator four that the majority of teachers used IT as an additional tool to help their teacher-centred teaching approach, which agrees with Cuban’s study (2001). However, there were an increasing number of teachers trying to use the student-centred approach. By taking the IT training sessions with hands-on tasks to fulfil the requirement of reaching the IIT or UIT, trial teaching with support from IT Team members, and PAR meetings to share vicarious experiences, teachers gained understanding of how to incorporate IT into their teaching of their own subjects. They would be able to design interactive multimedia Microsoft PowerPoint® teaching presentation and simple websites (Appendices K, L and M). The initial list of strategies incorporating IT in teaching helped teachers to use IT in their teaching as an additional tool to broaden their repertoire of teaching strategies, experience gained from trial teaching also enabled them to change their teaching practice from teacher-centred to student-centred approach.

5.7 CONCLUSION OF THE CHAPTER

From the analyses of the quantitative data obtained from the three surveys: one before the study, one after one year, and one at the end of the study, and teachers’ timetable reports for two years, the following conclusions can be drawn:

After attended the IT training session where teachers learnt how to use the features of Microsoft Word® to insert tables and graphics and develop interactive web pages, Microsoft PowerPoint® to develop interactive multimedia teaching presentation file, and the applications of Internet and Intranet, teachers were equipped with the required knowledge and skills to use computers better than before. Through hands-on practices, trial teaching and PAR experience sharing meetings teachers gained performance and vicarious experience of using IT in teaching. There was a statistically significant increase in teachers’ frequency of using computers from before the study to the end of
the first year of the study. In the period of sustainability study where PAR activities were organized by teachers themselves, there was an increase in teachers’ frequency of using computers in this period of the study though the increase was not significant. It means teachers continued to use, and used more computers after the training sessions. As the number of computers for teachers remained the same in the two years, it is reasonable to conclude that the training sessions and hands-on tasks empowered teachers to use IT, and therefore resulted in an overall significant increase in frequency of use of computers after the training sessions. The effects of the school-based, on-site and ongoing IT training sessions and PAR activities will be explored in case studies in the following chapter.

Similarly, after the intensive training sessions, teachers were empowered to use IT in their teaching. Result of analysis of teachers’ surveys shows a significant increase in teachers’ perceptions of their own IT skills at the end of the first year. From detailed study of teachers’ perceptions of their own IT skills with respect to level groupings, gender and age groups, it is found that teachers with lowest perceptions, including female, most of the older and a few younger teachers, had more percentage increase from the lowest average level to the low level. It seems that these teachers who were at a very low level of ability before had learnt some skills and were able to use them, so they were relatively confident at this ‘higher than before’ level. As they used mainly what they were taught, they would not encounter too much difficulty. The level of their perceptions could be sustained. Teachers with high perceptions were generally IT Team members who were either tutors or PAR group leaders. By serving as tutors and team members, they had to prepare the teaching materials by going through them themselves. By designing and carry out training sessions, they also learnt and became more confident, and reported the highest perceptions at the end of the first year, which agreed with findings of other research (Loucks-Horsley et al., 1987; Guskey, 2000). When they tried to use the more advanced features of the software, they experienced more difficulties and frustrations, and therefore they felt that they could not claim highest perceptions, but a lower level instead. They had enhanced realization of their abilities in using IT and IT in teaching.
It has been shown that teachers’ self-efficacy is significantly correlated to the perceptions of their own IT skills and their frequency of use of computers. The school-based, on-site and ongoing IT training sessions empowered teachers to use IT in their teaching, as reported in the previous paragraph. From detailed study of teachers’ self-efficacy with respect to value groupings, gender and age groups, it is found that, similar to the perceptions of teachers’ own IT skills, teachers with lowest self-efficacy, including female, most of the older and a few younger teachers, had more increase and the increase could be sustained. Teachers with high self-efficacy also improved in the first year, but dropped in the period of sustainability study like their perceptions of their own IT skills. There were reasons suggesting by teachers in the interviews. The result thus informs indicator two that a school-based, on-site and ongoing program with IT training and PAR activities help teachers to acquire vicarious experience and performance accomplishment and enhance their self-efficacy.

From teachers’ timetable reports over two years, it is found that, teachers used fewer strategies incorporating IT in teaching in one lesson in the second year, as compared with that in the first year, but they used more strategies incorporating IT in teaching in the second year, though the increase per teacher per week was not significant. The number of periods or lessons incorporating IT per teacher per week also increased significantly in the second year, meaning that teachers continued to use, and used more IT in their teaching after the training sessions. The average number of weeks where IT in teaching strategies were used per teacher per week also increased significantly in the second year, meaning that teachers were not using IT sporadically but throughout the year. This result confirms that such a professional development initiative helped teachers to use IT in their teaching.

The results from the analysis of data from the timetable reports revealed that popular strategies incorporating IT in teaching used by teachers were those mainly for helping teachers to teach in a teacher-centred paradigm. Teachers’ common strategies incorporating IT in teaching in the first year 2000-01 were Presentation by teacher (S1), Motivation (S3), Explanation (S4) and Creating Learning Environment (S6). There were many teachers asked students to help control the presentation too (S2). The total number of presentation (S1+S2)
made up a large proportion of the number of strategies incorporating IT in teaching used in the first year. In the second year, using ETV programs (S5) in CD-ROM or intranet format in teaching was very popular. Teachers also used IT to create a learning environment (S6) and as motivation (S3) and explanation (S4) tools. The number of presentations controlled by teachers (S1) or students (S2) decreased quite considerably compared with the first year. Teachers also experimented different ways of using IT in teaching and increased the list of strategies from 15 to 25. Many teachers used VCD (S16) and CD or tapes (S20) from the publishers in various subjects. After gaining the required knowledge, skills and confidence from the training sessions through hands-on activities to build up their own portfolio, when the resources were available, as a first step, many of the low-usage teachers reported more frequent uses of these strategies. It is a positive step towards the integration of IT into teaching and learning.

It was found that, similar to Cuban’s (2001) finding, the majority of teachers at Philanthropy Primary School used IT as an additional tool in their customary set of teaching practices to sustain existing pattern of teaching. However, there were a few teachers who showed changes of teaching practice by giving students projects, asking them to use the Internet to collect information and to present their projects in class. Although the numbers were relatively small in the first and second years, there was incremental change (Cuban, 2001) and the percentage increase was as high as 67% and 100%. Though popular strategies incorporating IT in teaching were still mainly teacher-centred throughout the two years, there was a growing number of teachers trying to use the student-centred approach.

From the quantitative results presented and summarised above, it is obvious that IT training sessions and PAR activities had helped teachers to increase their use of computers, perceptions of their own IT skills, and self-efficacy in the first year. After they were equipped with the required knowledge and skill in using IT in teaching, and under the mandate of using IT in 25% of their teaching, teachers’ average numbers of strategies, periods and weeks incorporating IT in teaching per teacher per week showed remarkable improvement. Teacher used strategies incorporating IT in teaching in
significantly more lessons and weeks. Although the majority of them use IT as an additional tool to sustain their existing pattern of teaching, there were increasing number of teachers who changed their practice using a student-centred approach through giving students more independent and active study in search for information, doing projects and presenting projects in class. The introduction of the intervention had caused significant changes in these two years. Although there were unexpected outcomes where teachers’ perceptions of their own IT skills and their self-efficacy in using IT in teaching decreased significantly in the period of sustainability study, there were reasons offered by teachers in their interviews which will be studied in detail in the next chapter.
CHAPTER 6 KEN – THE “KEEN” USER

6.1 CHAPTER REVIEW

Following the criterion specified in Section 3.4.3.2.1, Ken was selected because he was representative of a group of experienced male teachers who were keen to adopt IT in their teaching. He was the formal IT Coordinator who was in charge of the administrative work of promoting IT in the school. Although Ken completed two 120-hour advanced IT courses, he had rather low self-efficacy (26 out of a full score of 55, i.e., 47% of the maximum score) but nevertheless used a large number of strategies incorporating IT in teaching (103 strategies used). He was interviewed twice, and had engaged in some informal talks with the researcher during the period of the study. The following is his story. This chapter starts with Ken’s personal information and his training in computers and IT, then the changes in his frequency of computer use, perceptions of his own IT skills and self-efficacy in using IT in teaching by analysing his survey data collected before, during and after the intervention. From his timetable reports over two years, his patterns of teaching practice with IT was analysed and reported. From his interviews, Ken’s views on school-based training and PAR are also analysed and reported. From his portfolio, Ken’s beliefs about using IT in teaching were reported. As Ken was the IT Coordinator of the school, his views on the equipment of the school, the teaching software development, and the examination were also sought and reported. The chapter concludes with a summary of evidences for answering the four indicators of research question two: “what are the effects of a professional development initiative on teachers’ integration of IT in teaching”.

6.2 PERSONAL INFORMATION

Ken is a male teacher over 40 years of age. He graduated from a college of education and was recruited as a teacher at the beginning position of Certificate Master (CM). Later he obtained a bachelors degree in education part-time from the Open University of Hong Kong, and was promoted to the senior position of Primary School Master (PSM). His personal web page developed in 2001 said that he has been teaching for 23 years. His teaching
assignment during the study included Art, Chinese, General Studies, English and Mathematics in the first year, and General Studies and Chinese in the second year. Depending on the availability of staff and needs of the school, and the balance of workload, he was required to teach different combinations of subjects at various times. He was a relatively young male senior teacher compared with other senior teachers, taught Computer Literacy several years previously, and had taken two 120-hour advanced computer-training courses. When the principal wanted to foster IT in teaching and learning as an innovation policy in her school, she accepted the researcher’s suggestion to implement a school-based, on-site and ongoing professional development program with peer tutoring and PAR activities in her school. She formed an Information Technology Team (ITT) with young male teachers who were knowledgeable in computer applications as members. They were tutors of the training sessions and leaders of the PAR groups. She appointed Ken as the Information Technology Coordinator (ITC) who was responsible for planning and drafting documents, the logistics of organising the professional development seminars for teachers, overseeing the implementation and the management of resources such as teachers’ booking of the computer room and MMLC and the loan of the general teaching software to facilitate teacher access. She also appointed another young male teacher, who was technologically competent but, with less teaching experience, to manage the technical areas of the school network.

Ken is a carefree person willing to talk freely. From observations of his classroom, it was found that he interacted with the students freely and effectively. In his capacity as an IT leader he appeared to be collaborative rather than authoritative and gave his IT team members a free hand (Team members comment during the researcher’s contact with other teachers). He was eager and expressed his readiness to use IT in teaching on several occasions when the researcher met him at the school. However, he was a very busy person with so many tasks to do that he was seldom seen in his office. When he was there, he would be correcting and marking student assignments.
6.3 TRAINING IN COMPUTER AND INFORMATION TECHNOLOGY

Ken undertook training courses in a wide range of programs, which he justified with the following reflection:

I think the first factor is that I did not know IT. In 1995, I found examination papers printed by a computer looked good, so I learned the “Simple and Easy” input method in order to compile my own examination papers. It was quick and convenient to mark, and easy to store. If it were done on paper, I wouldn’t know where to shelve them, nor would I know how long it would stay there. I felt good from the start. Then I learned computer presentation and other things slowly, feeling that it was convenient and concrete. These are the advantages I have just mentioned. But I also had some fear at the start, too many software packages, and too many techniques (to learn). I really did not quite understand. I was not quite familiar with the contents of the first 120-hour advanced computer-training course. I grumbled sometimes - why couldn’t I learn and understand? Then I took another 120-hour training. I became more familiar (with the contents), and had some confidence. But even now I still have the feeling that there are some software packages that I don’t quite understand (how to use). It was all in a hurry. Now there is no time to learn. If I started to learn in the (early) 90s, I believe I could have reached the levels of other IT members. Time is very critical. Otherwise I would be able to write some simple computer programs. Now I can only use a few techniques of Authorware and have not mastered them all. I feel it very interesting, but it would be a bit more difficult. (Ka: 14)

Ken was fascinated by IT; he was keen to learn and took two 120-hour advanced computer courses. However, because he did not have enough time to really practice what he learnt, he was not confident to claim that he was good at IT. Instead, he claimed that he was a “new kid on the block” (Kb: 4).

6.4 FREQUENCY OF USE OF COMPUTERS

Ken reported that he had a computer at home and he had access to computers at school. The operating systems he reported in the first survey were Microsoft Windows 95®, Microsoft Windows 98® and Microsoft Windows NT®, in the second survey was Microsoft Windows 2000®, and in the third survey Microsoft Windows 98® was still included. In fact, computers in the teachers’ computer room had Microsoft Windows 98® and Microsoft Windows 2000® installed. So teachers had access to different Windows at the same time.

Although Ken did two 120-hour advanced courses before the study, he did not use computers very often and reported a frequency of only once a week in
the first and the second survey. However, after more than a year of using IT in
teaching in the study, he reported in his third survey that his frequency of using
computers had increased from once a week to several times a week in the
second year.

Ken used the “Simple and Easy” method for entering Chinese characters
into the computers throughout the three surveys, indicating that he was not a
professional user of the Chinese input system.

6.5 PERCEPTIONS OF HIS OWN IT SKILLS

As mentioned in the previous two sections, Ken had taken the 120-hour
computer-training course twice, and used computers to prepare examination
papers, however, he reported in the first questionnaire survey, before the PAR
intervention, that he regarded himself as only reasonably proficient in using
basic applications. Ken was rather apprehensive about computers and their uses
before the intervention, despite taking the advanced computer-training courses.
Although Ken’s self perception of his abilities was quite low at the beginning
of the intervention (a score of 16 out of a full score of 45), it was already higher
than many of the teachers in the school and ranked eight with four teachers
having the same scores.

Ken was very eager to take the lead. This was because he was the
Information Technology Coordinator who needed to be a role model for other
teachers as he indicated in the first interview (Ka: 16). However, the continuing
low score may be due to the fact that Ken might have still seen himself as being
ill-equipped to be a role-model for other teachers, when compared with other IT
team members (Ka: 14 cited above)

During the first year of the study, Ken had used these routine software
packages with some success (Ka: 14), but throughout the study, he did not
claim to have advanced to the expert level of using these basic applications, as
can be seen from Table 6.1.

After one year of practice in the study, his reported score was 19, which
was a little higher than his initial score of 16. However, when it was compared
with other teachers, he now ranked 13 with six teachers of the same score. The
highest score had changed from 38 to 40 and the mean score had changed from
14 to 22. The standard deviation was 8.42 which indicated that many other teachers had benefited from the training and their difference in abilities had decreased, but Ken’s improvement was relatively lower than that of other teachers.

Table 6.1
Ken’s perceptions of his own IT skills.

<table>
<thead>
<tr>
<th>IT Skills</th>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use word-processor (Microsoft Word®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Insert tables in word-processor (Microsoft Word®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use presentation software (Microsoft PowerPoint®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use a spreadsheet program</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Insert graphics in word-processor (Microsoft Word®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use a scanner</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Design presentation software (MS Microsoft PowerPoint®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use the Internet (Microsoft Internet Explorer®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use email</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use the Internet (Microsoft Internet Explorer®)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Set up computer hardware</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Set up computer software</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use computers for graphics and music</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Format a hard disk</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Use a database program</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Write computer programs</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
</tr>
<tr>
<td>Total out of 45</td>
<td>16</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

Key to the codes:
0: Does not have that skill
1: Has some knowledge about that skill
2: Is satisfactory in using that skill
3: Has expert knowledge in using that skill

For more advanced uses of basic applications such as Microsoft Word® and Microsoft PowerPoint®, applications for the scanner and email, Ken reported increases in perceptions of his abilities after the seminars and practices for one year. His perceptions of being quite good in using these programs and device remained so in the third survey. He was less confident in using the Internet until the second year, and improved in his self-reported skills. When probed about the more technical aspect of IT applications, Ken claimed that he knew something in setting up computer hardware and software, as well
as using computers to process graphics and music.

At the end of the second year, Ken’s perceptions of his own IT skills was sustained and he ranked eighth again with five other teachers, and the perceptions of the whole group of teachers dropped. The highest score was only 29 and the mean was 17. The standard deviation was only 6.67, which was smaller, indicating the difference in perceptions among teachers became smaller. Although Ken’s perceptions of his own IT skills did not rise as quickly as other teachers, it was sustained while those of other teachers dropped significantly. In more advanced computer applications such as formatting a hard disk, using a database program and writing computer programs, since these topics were not included in the school-based IT training program, Ken maintained that he knew nothing in these areas during the whole study. This result highlights how the “external” factor of IT competency requirements was a strong motivator. If the task was not on the competency list, teachers did not bother to explore the skill.

Ken reported good perceptions of his skills in using the Microsoft Excel® spreadsheet before the study, however, after taking the school-based IT training program “I9 Applications of Spreadsheet” (Please refer to Appendix F for the codes and names of the training topics and timetable, and Appendix L for the required content), his perceptions decreased to a low level, claiming he knew only a little about using a spreadsheet.

In short, after taking the school-based training and with practice in class teaching using technology, Ken felt more confident in using the applications taught by his peers. However, he remained less confident when it came to those applications which were not specifically taught. The results agreed with his first survey that even though he did the 120-hour course twice, he was still not confident. However, the school-based training taught by peers with hands-on tasks supported by peers enhanced his perceptions and self-efficacy. Thus the professional development initiative is an effective way for teachers with low initial perceptions like Ken.
6.5.1 KEN'S EXPLANATIONS OF THE CHANGES IN PERCEPTIONS OF HIS OWN IT SKILLS

The first survey indicated the 120-hour IT training courses did not enhance Ken’s perception of his IT skills. Ken admitted in the interview that he did not learn much in his first 120-hour IT course because in the early stage of promoting IT among teachers, the tutors and participants were not clear what to teach and what to learn.

In the first time, the preparation was not enough. I was not saying that the instructors did not prepare, but the whole structure was not well prepared. All of us did not know what to learn. The instructors did not know what we wanted to learn. So we were just groping about. (Ka: 19).

Ken pointed out that participants wanted to learn something and tutors wanted to teach something, but their expectations did not match. Ken’s view was confirmed by teachers of other schools who attended the courses. Because of the differing expectations of the course, participants achieved little of value. He did not learn much (Ka 19-20). In the second 120-hour course, Ken complained that the organiser just grouped participants ad hoc with no regard to their abilities, so skilful participants were mixed with novice learners. The content was too advanced for those with low skill levels like him, so he did not learn much again in the second course

The second time was not very good, too. Some of the teachers had already known some of the contents. They knew how to do and just needed some more technical upgrade. While some other teachers, like me, who had very low techniques, did not know what to do. Though there was gain, but the gain was limited. (Ka 20).

After the school-based training sessions, Ken finished his portfolio of Intermediate IT competence. Though he was keen to learn, he was not confident enough to claim Upper Intermediate IT Competence.

I think most of the teachers have reached IIT, but some teachers, like me, are still a bit short to reach UIT. I want to learn mainly programming, like Authorware, Flash and other softwares. This is one aspect. The next thing I think of is the school software bank or education bank (intranet), the one that belongs to the school, not on Hong Kong Education City, because the software of one’s own school is most suitable. We should develop the teaching resources in this area. Now every teacher has a portfolio which has been included in the bank. As a starting point, I think the techniques will become more mature, not singly PowerPoint® any more. Now it’s like specified action. When teachers become more skilled, they will place their teaching preparations there (on the intranet) and use them when they teach the topics later (Ka: 46).
From his responses, it seems apparent that Ken was rather apprehensive of computers and IT even though he had taken two advanced IT training courses and the school-based training sessions. He was interested to learn but did not have the time to pursue IT knowledge further by himself. As an IT Coordinator, he was limited by his knowledge and confidence.

6.6 KEN’S SELF-EFFICACY IN USING IT IN TEACHING

Ken was apprehensive in using IT in teaching before the study. Except for claiming that he knew how to manage effectively the learning environment for using computers in the classroom, he expressed little confidence in using computers effectively as a teaching tool in the classroom or that he could advise students how to use computers in their study. Ken did not think he had the knowledge, skills and confidence in using computers in teaching, and he was afraid of using computers, despite the fact that he had taken two 120-hour IT training courses. So in the first survey before the study, Ken’s self-efficacy in using IT in teaching was well below average (Table 6.2, Survey 1). In his interview, he regarded himself as a ‘new kid on the block’, not quite familiar with the tasks (Kb: 4).

After learning about, and using IT in teaching in 24 sessions of school-based training on various subjects in the first year of the study, Ken’s personal self-efficacy on using IT in teaching underwent positive changes. First of all, he reported that he was no longer afraid of using computers but now liked to use them instead. He was confident in using computers at work. If possible, he would use computers to teach in the classroom. He knew how to follow the steps to use computers effectively as a tool to aid teaching and how to get students to use computers for study purposes. Although, he felt that he could now advise students how to use computers in their study, he was not so sure that he would always be able to answer their questions relating to using computers. He found himself often able to use computers effectively as a teaching tool and considered that he now had sufficient knowledge and skills to use computers in effectively teaching. Ken’s self-efficacy had improved remarkably from 26 to 42 out of a full scale of 55 after the school-based training, teaching trials and PAR (Table 6.2, Survey 2).
Table 6.2
*Ken’s self-efficacy in using IT in teaching.*

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Self-Efficacy Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>N</td>
<td>A</td>
<td>I know how to manage effectively the learning environment of using computers in the classroom</td>
</tr>
<tr>
<td>N</td>
<td>A</td>
<td>A</td>
<td>I don’t feel it is difficult to advise students how to use computers in their study</td>
</tr>
<tr>
<td>N</td>
<td>A</td>
<td>A</td>
<td>I am often able to use computers effectively as an assisting teaching tool in the classroom</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I have already had sufficient knowledge and skills to use computers in teaching</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I know how to follow the steps to use computer effectively as tool to aid teaching</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I have confidence in using computers at work</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I know how to get students use computers to study</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I am satisfied with my results of using IT in teaching</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>N</td>
<td>I’m not afraid of using computers</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>N</td>
<td>I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom</td>
</tr>
<tr>
<td>D</td>
<td>N</td>
<td>N</td>
<td>I can always answer students’ questions relating to using computers in study</td>
</tr>
</tbody>
</table>

26 42 42 Total out of 55

Key to the codes:
SA: Strongly Agreed (5)
A: Agreed (4)
N: Neutral (3)
D: Disagreed (2)
SD: Strongly Disagreed (1)

While some teachers showed a decline in self-efficacy scores in the second year, Ken’s positive attitudes towards using IT in teaching sustained. He reported minor changes in the third survey. He did not claim that he had sufficient computer knowledge and skills to use computers effectively in teaching in the classroom after trying to use the classroom computers. As classrooms equipped with computers did not have a technician standing by as in the MMLC and computer room, teachers had to operate everything from controlling the data projector to starting Microsoft Windows® and application programs. The researcher often saw teachers who could not operate the data projectors successfully in their teaching calling the technician to come to the classroom to help. Teaching with IT in the classroom did pose some problems for teachers. However, Ken claimed again that he knew how to manage effectively the learning environment for the use of computers in the classroom, but he was not confident that he could answer the questions from students on using IT in their study.
6.7 INFORMAL TALK WITH KEN

In an informal talk with Ken after the study in December 2002, Ken gave an explanation for the decrease in teachers’ perceptions of their own IT skills and self-efficacy. He believed that teachers’ skills had advanced to a higher level after the first year of IT training and PAR activities, so they expressed their growth in confidence and perceptions by selecting higher options on the scale. After working for one year, they learned more and used those strategies incorporating IT in teaching that they believed to be effective. Teachers became selective and began to use only those strategies or techniques that they thought worked or were perhaps worth the effort. Thus the number of strategies incorporating IT in teaching was less used per period, but they used IT in more lessons, hence the number of periods incorporating IT increased. As teachers’ abilities increased, they were not satisfied with their current techniques and wanted to try something more advanced, but met more problems on the way. They preferred a lower option to the one they chose before. It explained why there was a decrease in perceptions and self-efficacy in the end of the second year.

6.8 KEN’S PATTERNS OF TEACHING PRACTICE WITH IT

The data from the timetable reports in which Ken recorded the strategies (as defined in Table 3.4 of Section 3.4.3.3.2) he used in his teaching of various classes, are summarised in Table 6.3 and discussed in the following section.

6.8.1 PATTERNS OF TEACHING PRACTICE IN THE FIRST YEAR

In the first year, Ken taught five subjects, namely, Art, Chinese Language, General Studies and Mathematics. His patterns of teaching incorporating IT are summarised as below:

6.8.1.1 ART

Ken used a total of 12 strategies in his Art classes over the year. He mainly used the Internet to create a learning environment where he could motivate the students by colourful websites with real-life and the most up-to-date information, and guided them about finding relevant and explanatory information and resources, as he said in the interview:
Web surfing is for the Art subject. Students can see the paintings of famous artists from the collection of museums. We mainly looked at the collections of the Hong Kong Museum (Ka: 8).

He also used IT for remedial work for the low achievers and as a reward for those who finished early.

Table 6.3
Record of Ken’s use of strategies incorporating IT in teaching.

<table>
<thead>
<tr>
<th>Strategies incorporating IT in teaching</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Presentation controlled by teacher</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>2) Presentation controlled by students</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>3) IT as motivation tool</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>4) IT as explanation tool</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>5) ETV</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>6) Creating learning environment</td>
<td>13</td>
<td>19</td>
</tr>
<tr>
<td>7) Use IT as remedial teaching</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>8) Use IT as rewards for accomplishing early</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9) Rotating groups of different tasks</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>10) Small groups of the same task</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>11) Teaching in the computer room</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>12) Project development</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>13) Project presentation by students</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>14) IT as information tool</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>15) Collaborative learning environment</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>16) Using OHP</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17) Using VCD</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>18) Using web resources</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total number of strategies</td>
<td>103</td>
<td>86</td>
</tr>
<tr>
<td>Mean no. of strategies per week in each year</td>
<td>4.29</td>
<td>2.53</td>
</tr>
<tr>
<td>Total number of periods using IT in teaching</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Mean no. of periods using IT per week in each year</td>
<td>0.96</td>
<td>0.93</td>
</tr>
<tr>
<td>Mean no. of strategies per period</td>
<td>4.29</td>
<td>2.83</td>
</tr>
<tr>
<td>Total number of weeks using IT in teaching</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Mean no. of weeks using IT per week in each year</td>
<td>0.48</td>
<td>0.63</td>
</tr>
</tbody>
</table>

6.8.1.2 CHINESE LANGUAGE

Ken taught Chinese Language and Chinese Dictation to the Primary Five class. He met the students 11 times a week, including one period for dictation, so he could afford to spend up to 13 periods in the computer room using IT. He used IT most in teaching Chinese, in 55 out of 103 strategies. The strategy he used most was Microsoft PowerPoint® presentation. He used it eight times and asked students to help five times, a total of 13 times. He developed a Microsoft PowerPoint® presentation on Chinese phrases. Ken also used IT as an
information tool nine times. He arranged students in small-groups (six times) and rotated groups (four times) to have hands-on study using IT. On other occasions, he used IT for motivation (four times), explanation (twice), project development (five times) and project presentation (once), as well as for collaborative knowledge building through the network (four times).

6.8.1.3 GENERAL STUDIES

Ken met the students in General Studies lessons five times a week. He used IT in his teaching in five periods and used 22 strategies altogether. Since General Studies has more software packages, CD-ROMs and websites, he used Microsoft PowerPoint® presentations sparingly, twice by himself and once by the students. The strategies he used more often were motivation (five times), explanation (four times) and creating a learning environment (four times). He even used IT for higher levels of constructivistic applications like project presentation (twice) and collaborative knowledge building (once). Students were engaged in hands-on activities in rotated groups (once) and small-groups (twice).

6.8.1.4 MATHEMATICS

There were seven periods of Mathematics per week. However, Ken used IT in only three periods with 14 strategies used. As an example of how he taught one of the lessons, Ken detailed how he constructed a Microsoft PowerPoint® file with various quadrilaterals and use it to create a learning environment in the class through which he aroused students’ interests and attention, and used the figures to help students understand the properties of the quadrilaterals. He also encouraged students to do their own presentations.

6.8.2 SUMMARY OF THE FIRST YEAR

In the first year, there was only one computer room, one multimedia language centre and three classrooms equipped with a ceiling-mounted LCD display projector (data projector), and the computers in the classrooms were not well set up. Ken managed to teach with IT in 24 periods and used 103 strategies
which were very good compared with other teachers. He ranked number four in the whole school, just after the three teachers who were IT oriented and used IT the most. He used PowerPoint® files as computer presentations in a teacher-centred paradigm. He controlled the display of Microsoft PowerPoint® slides himself or asked his students to control the slides for him. He also used IT to create a learning environment so that he could motivate the students and students could learn in context. He then moved slowly to engaging students to work by themselves in small-groups, and offered the incentive of using computers as a reward for finishing early. At the end of the first year, Ken had used quite a number of the student-centred strategies such as getting information from the Internet, students’ project development and project presentation.

Ken was keen to use IT in teaching because he believed that:

IT can provide images, and IT is interactive and concrete. IT can bring things from faraway to the notice of the students, so that knowledge is more available to them. And it can help students understand some abstract things that cannot be explained in words like the information on Chinese Opera, which can be introduced better using a VCD. This technique of using IT can help teachers to achieve effective teaching and facilitate students’ learning (Ka: 10).

From the detailed reports on each subject and the summary of the strategies incorporating IT in teaching listed in Table 6.3, Ken’s teaching approach in the first year was mainly expository which was teacher-centred and teacher-directed (Hewit & Whittier, 1997). From his classroom observations, Ken used presentations and IT to create a learning environment by displaying graphics, video, animations or films for classroom discussion. He also used IT as motivation, explanation and as an information tool. He reported that he also grouped students into small-groups and rotate-groups many times. His model of teaching had much in common with a student-centred but teacher-directed discovery approach (Hewit & Whittier, 1997). He also asked students to do presentations and projects using IT in an inquiry approach which was also student-centred (Hewit & Whittier, 1997).
6.8.3 PATTERNS OF TEACHING PRACTICE IN THE SECOND YEAR

In the second year, in addition to asking teachers to report their weekly usage of IT, they were also asked to report what software or websites they had used, their feelings about the applications, any obstacles that they came across and a solution that they would suggest. The following were Ken’s applications of IT in teaching his subjects.

6.8.3.1 CHINESE LANGUAGE

Ken used 24 strategies in nine periods of one class and nine strategies in five periods of another class of Chinese Language. The strategy he used most was setting up a learning situation in the class, which he reported six times. He used VCDs also six times. From his report, the VCDs he used were provided from the textbook publishers. The first one he used was the phonetic part of the Primary Chinese Language Teaching Package. His feeling was that the VCD was beautifully made, but it was one-way and not interactive. Ken also found that the time available for using software was inadequate. His solution to these obstacles was to take an active training role by the teacher. The next two VCDs were the Selected Teaching Software for Modern Chinese Language, Primary Six and Four. He did not report any reflection or obstacles, and put it as creating a learning environment. He also used two websites: http://yahoo.com and http://www.geocities.com/gocheat to search information on “the Father of Optical Fibre”. He also used IT for motivation and explanation, each one five times. He also used ETV four times.

6.8.3.2 GENERAL STUDIES

Ken used more strategies on General Studies than other subjects. Out of 16 periods, he used 53 strategies, an average of three strategies per period. He used the government website http://www.gov.hk to create a learning environment and motivated students to study themselves. He also used it for explanation, and asked students to do some searching. His comments were that students could understand directly, but there was not enough time to cover all, so only the main points were touched. Ken used the website http://yahoo.com to search for animals like the panda, and parrot. His comment was that students found it interesting. He used the same website at other times to search for
information on infectious diseases. He also found that students were interested.
He used the CD from the Education Publisher for the textbook *General Studies
Today, Primary Five* to create a learning environment, where he asked students
to take control of the presentation from the CD. He also showed excerpts of
Education TV nine times.

From the data recorded on timetables throughout the two years, teachers
used more strategies incorporating IT in teaching in the first year than the
second year. But teachers used more periods with IT in teaching in the second
year. The average number of strategies incorporating IT in teaching period was
3.77 in the first year and 1.60 in the second year. Ken too used fewer strategies
in number and varieties than the first year, from 4.29 to 2.83 strategies per
period. Ken used ETV programs, VCDs and websites to create a learning
environment where he could motivate students’ interests, and explained to them
the main points. He also gave students hands-on work by arranging students in
rotated groups or small-groups to use the computers, and asked students to
work on projects and to learn collaboratively in class. He used presentations
himself three times and his students used only once in a teacher-centred mode.

From his classroom observation, Ken was able to use IT effectively by
more than just displaying the slides. He used IT to motivate, explain, and
engage the students, as he claimed in his timetable report and portfolio.

### 6.9 KEN’S VIEWS ON SCHOOL-BASED TRAINING

Ken compared the school-based training program with courses offered
outside the school.

The advantage of studying here (on-site) is that it is very convenient for
teachers to raise questions. Tutors are very willing to discuss and ready to
answer queries. Studying outside is just like “distant water which cannot
put out a nearby fire” (Researcher’s note: this is an old Chinese saying. It
means off-site courses cannot help very much when they are in need of
assistance urgently). School based training is better because the
atmosphere is better and the time arrangement between colleagues can be
matched. Here is better, more convenient (Ka: 25).

He used the metaphor which means that when there is a problem in
off-site training programs, you cannot get help easily. He stressed the point that
school-based, on-site and ongoing professional development is a good approach
because teachers can allocate/commit their time (Ka: 22).
6.10 KEN’S VIEWS ON PAR

During the interview, Ken was asked for his opinion on the Participatory Action Research (PAR) program which had been running for one year. He considered that it was very good to have such exchanges of opinions and experiences among teachers.

Yes, just for discussing and sharing what the other colleagues are doing: what do other teachers have; what do I lack of and what is worth learning. If there is no time for sharing, we cannot exchange opinions and technique. It is very good to have such (a chance of) exchange of opinions (Ka: 28).

Ken mentioned three limitations in PAR: one was the time, the other was teachers’ ‘maturity’, and the last was the lack of facilities.

6.10.1 TIME

Ken highlighted two issues in relation to time. The first one was that there was no time really dedicated to PAR. As expressed by other teachers such as Flora and David, the PAR period was used for announcements by senior teachers, Ken believed there was no time too (Kb: 2). He thought that:

The time arrangement was not very good for the groups. May be we should set a definite time for teachers to sit down, the outcome would be better (Ka: 23). … I mean a timetable after school. Teachers sit down to discuss which software to use is better and share the experience. It should not take more than 30 mins, maybe just 5 to 10 mins (Ka: 27).

The second issue Ken proposed was that the process of development takes time.

Techniques come slowly. It takes time to learn. I think it cannot be done so quickly. Principal and teachers all have to develop a personal homepage. Some of us may still not quite familiar with the techniques of making web pages. Though we learned them last time, but have forgotten. So I have proposed to give those teachers a review course if they feel the need, and allow them to place their materials or information into their own folder. Students can browse teachers’ excellent website at home or in school. This is planned and may be done next year. But training must be done well. What we have done is to acquire a web server. I think we can use it at least temporarily (Kb: 10).

6.10.2 MATURITY

Ken saw that there was limitation when teachers did not have enough knowledge in PAR at the beginning.

I think a timetable is needed. And also, the degree of maturity (of teachers is important). In the past teachers were not mature in IT, but now we are
mature and we can discuss in a more effective way. We may try to set a time. We did not know what to talk about when we sat down in the past. Now we know a bit and can talk about it. We have a sense of achievement (Ka: 29)

If PAR was pushed, there would be some energy in each group and there would be force between the groups.

When Ken was probed that PAR did not help much, he stressed again that PAR made teachers think and discuss, and know what to discuss. If there was no PAR, teachers would not even be able to know what to discuss (Kb: 11). He pointed out, as an example, that IT team members met and shared often.

Peers in the IT Team are doing that because they have to discuss very often. Although it is not very formal, but when they sit down together, they will discussed the problems which are encountered by some colleagues and how to solve them. This is good (Ka: 64).

6.10.3 FACILITIES AND THE ASSOCIATED TRAINING AFTER UPGRADE OF FACILITIES

Ken believed the lack of facilities was another problem. When the facilities were upgraded, there would also be the need for upgrading teachers’ knowledge by further training after this training period.

What I mean is future training, the training after the completion of this stage. How to enhance? Where is the problem? I feel in the long term, it is necessary to have training, but it does not need to be so intense, for example, Authorware in the first term and Flash in the second term. We have mastered the basic already (Ka: 48).

When Ken was asked about the compulsory timetable report, he said that teachers were willing to fill in the timetables and return them voluntarily. Filling timetable reports would not put pressure on teachers but would encourage teachers to try because “others used IT, I should also try (Kb: 16)” and “I have not tried for five weeks and have to try once (Kb: 15)”. He was planning to carry on with PAR and put it into the Teaching Research Group for future years. He thought that with the acquisition of a web server, teachers could put teaching materials on the server, and all teachers and students could use them. By doing so, the school would build a foundation. The future development of IT in teaching will be easy using this platform (Kb: 10).
6.11 KEN’S BELIEFS EXPRESSED IN HIS PORTFOLIO

Besides the initial workshop by the researcher on the development of multimedia Microsoft PowerPoint® slides, as part of the staff development sessions on how to devise lesson plans and teaching notes, teachers were taught specifically how to insert tables and graphics in a Microsoft Word® document and a Microsoft PowerPoint® presentation file. Teachers were also taught more detailed instructions on the development of multimedia teaching materials using Microsoft PowerPoint® and web pages using Microsoft Word®. After taking these sessions, teachers had some hands-on practice and produced a document on the reflections on using IT in teaching, and a Microsoft PowerPoint® presentation with some graphics and links. They are required to send their portfolio to the principal as evidence of attaining the required competence and for submission to the Education and Manpower Bureau when requested.

Since he had taken two 120-hour IT training courses, he was not required to hand in similar assignments. However, being the IT Coordinator, he wanted to take the lead, as he said during the interview:

... Although I do not need to do the portfolio, but in order to lead other teachers, I did do it. I spent five days to do the portfolio during the vacation. In fact, I was to head a start for my colleagues that someone had done it. Your (the researcher’s) help had hurried up the progress quicker. If there were nobody to make a head start, colleagues would feel differently. So I took the lead. At that time I didn’t know that I was not required to do, but I did it first and it took a lot of time. I then told my colleagues that I spent five days coming (back to school) to do it but I still could not finish. Colleagues had to go to classes and do other work. After hearing what I said, everyone worked busily on it. (Ka: 16).

There were usually two components of the portfolio that were of interest. The first one was teachers’ perceptions of the rationale for using IT in teaching and learning that might include the advantages and disadvantages of using IT in teaching and learning. The other one was teachers’ reflections after using IT in teaching.

6.11.1 RATIONALE FOR USING IT IN TEACHING AND LEARNING

In his portfolio Ken commented about the advantages of using IT in teaching in three aspects. The following list of the advantages was written by Ken in Chinese and translated into English by the researcher. The first aspect
was the advantages of using IT in teaching for students:

- Innovative technology brings in new stimulation which greatly enhances students’ interest;
- Resources from the web can provide more genuine and direct knowledge which is beneficial to the students;
- Activities centred on presentation are novel and interesting, and can motivate students to learn with eagerness.

The second aspect was the advantages of using IT in teaching for teachers:

- Using IT in teaching will make the flow of teaching smoother and more convenient;
- Teachers can keep abreast of time, and learn knowledge beyond the textbook;
- Teachers can jump out of the traditional Chalk and Talk teaching model and try to use innovative teaching models with a paradigm shift.

The last aspect was the advantages of using IT in teaching for schools:

- IT in teaching and learning brings forth innovative teaching methods, and provides the school with new opportunities for teaching and trials;
- Upgrading and updating the teaching resources of the school so as to meet the trend of study in the Information Explosion Era of the 21st Century;
- Utilising IT in teaching can enhance the teaching quality of the school, and make the learning of the students relevant and useful so that students can make contributions to the society in the future.

If the school can use IT in teaching, it would then be more able to foster students’ abilities to use IT and to keep abreast of the needs of the future world. Using IT in teaching can enable students to learn more knowledge in the limited time and space to match the pulse of the development of the society. In this era of paradigm shift, learning to use IT in teaching is an unavoidable trend (from Ken’s portfolio).
6.11.2 REFLECTION AFTER USING IT IN TEACHING

After using IT in teaching, namely, computer presentation, downloading pictures from the web, editing captured-video files, hyperlink to learning webs, and students’ use of presentation to report their project in the teaching of a General Studies lesson, Ken made the following reflection:

In the process of teaching, students could concentrate on learning how to use Microsoft PowerPoint® presentations to report on the symbols of environmental protection organisations and their working areas. Students’ learning process was more direct and efficient. Though students experienced difficulties in the process of presenting the discussions in small-groups, under the encouragement and guidance of the teacher, they experienced the first time the joy and the hardship of using an IT presentation. This was a learning experience hard to come by, and also a successful experience. The factors of success were that students were interested in learning, and there were few problems in the teaching process. Students could get valuable information instantly. Students had the opportunity to participate in the electronic presentation. Throughout the teaching process, I could feel that students’ learning process was enjoyable, and within a new teaching model.

The teacher found the teaching process enjoyable because once he mastered the techniques, he had little problem in supporting students to learn. He believed that a teacher could introduce a lot of content to the students in a very short time. So the teaching could be considered as a successful experience for him.

In the beginning of the lesson, the teacher spent some time searching for the files. Once the files were found, the lesson progressed smoothly. Should the teacher placed the files properly, the trouble could be avoided. Using IT in teaching would face ever-changing problems, hence, teachers should upgrade themselves to strengthen their abilities in using IT in teaching (From Ken’s portfolio).

6.12 KEN’S VIEWS ON OTHER AREAS

6.12.1 EQUIPMENT

When it came to the supply of equipment, Ken reported that there were still some classrooms without a projector and computers often broke down. Teachers would grumble and complain when their computers broke down (Kb: 6). It meant that some teachers had used IT as a common teaching tool.

6.12.2 TEACHING SOFTWARE DEVELOPMENT

In contrast with countries where the teaching curriculum is thematic and school-based, and teachers prepare their own teaching materials, Hong Kong teachers rely on school textbooks for prescribed teaching approaches. As mentioned in Chapter Two (Section 2.7.1.4), teachers have to follow the
teaching schedules set by subject panels and finish the required contents in a predetermined time frame so that all students are taught the same topics. When teachers were encouraged to develop their own teaching materials, many of them believed they did not have the abilities and time to do so. Ken perceived that the direction of their school was that teachers just needed to use the information on the web and link it to a lesson. He suggested that teachers should not endlessly develop teaching materials as this task should be left to the textbook publishers (Ka: 62). Ken also believed that another way of increasing the availability of IT-based teaching materials for teachers was sharing among themselves. (Ka: 60).

6.12.3 REDUCE EXAMINATIONS TO MAKE TIME FOR IT

Ken pointed out that time was a problem in the promotion of IT in teaching and the PAR program because there were not only IT reforms, but also other reforms (Ka: 54). The examinations were very demanding. There were four tests and two examinations, six assessments over a ten months’ period. Teachers needed to set a paper every one and a half months. He believed assessment is necessary, but not so frequently. Once a year so that students know what an examination is, would be enough (Ka: 67-68).

6.13 SUMMARY OF KEN’S STORY

Ken’s story has been constructed from extensive data collected from the three surveys, two years of timetable reports, two formal interviews and many informal exchanges of ideas, classroom observations and portfolio content. From these data, Ken was keen to learn and use IT in his teaching. He took two 120-hour advanced IT courses and was positive in organising and taking part in the school-based training sessions.

From the survey data, the two 120-hour advanced IT training courses at the universities did not seem to improve the perceptions of his own IT skills and self-efficacy in using IT in teaching much. However, after the school-based, on-site and ongoing program with IT training sessions and PAR activities, where the tutors were his peers who had better IT knowledge (heterophilous) but worked in the same environment and culture (homophilous) with him, and who were able to put themselves into his situation and understood his problems
(empathy) (Rogers, 1995), together with completing the portfolio and achieving some successful performance experience, his perceptions of his own IT skills and self-efficacy in using IT in teaching increased steadily (Bandura, 1977b) in the first year. He attributed these changes to the school-based, on-site and ongoing program because it was convenient for him to seek help whenever he had trouble and the help was just a few seats away. He also believed that the ongoing feature of the program was very helpful which agreed with McDougall and Bretts (1997). These results informed indicators one: “what will be the change in teachers’ perception of their IT skills as a result of the intervention” and two: “what will be the change in their self-efficacy as a result of the intervention”. Ken’s perceptions and self-efficacy had increased after the intervention. These results also informed indicator four: what are the changes in teachers’ practice” that his successful experience encouraged him to try using IT in more lessons and weeks.

Ken believed the PAR was useful, although the time was short, only five to ten minutes to share experiences, and it gave teachers time to think and discuss. Ken believed that the timetable report was needed. It was useful because it reminded teachers to take the opportunity to try.

Since Ken was brought up in an atmosphere of study for marks and worked in an environment which was examination-oriented and schedule-tight, his teaching was traditional as described by Biggs (1996), Chung and Ngan (2002), Lo (2000), and Salili (2001) in Section 2.7.1.7, 2.7.1.8 and 2.7.2. Though he used the strategies incorporating IT in teaching in an expository teaching approach (Hewit & Whittier, 1997), he enhanced his teaching by using websites, Microsoft PowerPoint® presentations, VCD and other teaching materials on CD-ROM which were multi-sensory, vivid, concrete, distance-independent, and helped students to understand. The findings informed indicator three: “what are the teachers’ common strategies in using IT in their teaching” that, because of the culture and constraints, Ken’s common strategies in using IT were mainly for creating a learning environment in which IT was used for motivation and explanation. In his portfolio, Ken pointed out that IT makes teaching flow smoothly, and a lot of content could be delivered in a very short time. This confirmed the contextual analysis that Philanthropy
Primary School was obliged to follow the subject-based, examination-oriented, highly segregated and schedule-tight education culture. His teaching practice was still rather teacher-centred, but through the intervention of the study he was exposed to student-centred learning, and had tried using new strategies commonly used in student-centred learning approaches. He used small-groups and asked students to do projects and presentations. He believed that students concentrated on learning, and the learning is direct and efficient. To inform indicator four: “what are the changes in teachers’ practice”, though his fundamental epistemological beliefs were still rather transmissive, didactic and teacher-centred, there was evidence that he started to ask students to work on their own through group work, project development and presentation. As teachers’ beliefs are remarkably resistant to change (Sandholtz et al., 1997), it needed time for Ken to change. However, Ken’s teaching techniques were enriched through the school-based, on-site and ongoing program with IT training sessions taught by colleagues and PAR activities.

The issues and problems he encountered were an examination-orientated environment where there were too many examinations and tests, a shortage of time for teachers to develop and try out new ideas, the frequent breakdown of computers, and the lack of support in classrooms when using IT in teaching. These issues and problems affected Ken’s use of IT in his teaching.

Despite the issues and problems, Ken’s frequency of computer use, perceptions of his own IT skills and self-efficacy had shown improvement after the intervention, so in conclusion, this model of staff development was successful for Ken.
CHAPTER 7 DAVID – THE “EXPERT” USER

7.1 CHAPTER OVERVIEW

Similar to Ken’s case, David (pseudonym) was selected because he was representative of young teachers who had high self-efficacy and used a large number of strategies incorporating IT in teaching. He had been formally interviewed three times and informal conversations and discussions were held several times over the two-year period of the study. The following is David’s story. This chapter starts with David’s personal information and his training in computer and IT, then the changes in his frequency of computer use, perceptions of his own IT skills and self-efficacy in using IT in teaching by analysing his survey data collected before, during and after the intervention. From his timetable reports over two years, his patterns of teaching practice with IT was analysed and reported. From his interviews, David’s views on school-based training and PAR are also analysed and reported. From his portfolio, David’s beliefs about using IT in teaching were reported. His comments on the actual implementation of the study were also reported. The chapter concludes with a chapter summary which complements the quantitative findings in Chapter Five in order to answer research question two: “What are the effects of a professional development initiative on teachers’ integration of IT in teaching”.

7.2 PERSONAL INFORMATION

At the beginning of the study in 2000, David was a 25-year old young male teacher who graduated from an engineering department of the University of Hong Kong of Science and Technology and had been working as a teacher for about 3 years at the commencing position of Certificate Master (CM). He studied a Master of Education course from 2001 at the Open University. His teaching assignments during the study included English, Mathematics, General Studies and Computer Literacy in 2000 to 2001, English, Mathematics and Physical Education in 2001 to 2002. As a recent graduate, he had good IT skills, and thus he was appointed as a member of the IT Team, responsible for teaching part of the program of the school-based training sessions and helping teachers in their applications of IT in their own teaching in the PAR group.
David was a conscientious and relatively quiet teacher who shared his experiences after developing a close rapport with the researcher. He was interested in computers and often installed and trialled various cards and peripherals. He was also keen to develop IT-based teaching materials for use in his teaching and ready to share his experiences with other teachers. For example, he presented a CD-ROM containing his teaching materials to the researcher for placement on the Information Technology in Education Network (ITEN, 1998) website for teachers in Hong Kong and elsewhere to share. In his first interview, David expressed his belief that even the dullest content could be taught effectively by using IT to arouse students’ interest.

Students find it innovative; IT gives them some interest; they are willing to listen; they find what we said new; they will listen carefully and will not feel dull; they have great interest, great interest in looking at everything. (Da: 4).

David was an early adopter and keen to use IT in teaching. The following section will examine his training in computer and information technology which has made him a skilful user of IT.

7.3 TRAINING IN COMPUTER AND INFORMATION TECHNOLOGY

David took the 120-hour course offered by the University of Hong Kong on IT training. He had learned how to use Authorware®, Microsoft PowerPoint®, Microsoft Excel®, Hyper Studio®, Photoshop® and Paint Shop®, and web authoring using the Microsoft FrontPage® before the study (Da: 24, 27). From his contacts with David, the researcher established that David was keen to learn computer skills and familiarised himself with software packages by teaching himself.

7.4 FREQUENCY OF USE OF COMPUTERS

David had over three years of experience in using computers before the study. He had a computer at home and he was able to access computers at school. David had the highest frequency of computer use throughout the study. He reported using computers daily for learning IT skills and word processing. The operating system he used over the last two years was mainly Microsoft Windows 98®, but he was also able to use Microsoft Windows ME® and
Windows 2000®. David, like Ken and other teachers at the school, did not have any experience of using other operating systems such as Macintosh, Linux or UNIX.

David reported that he used the “Changjie” Chinese input method in the first survey and the “Simple and Easy” input method in the second and third surveys. As studied in Sections 2.7.6 and 4.3.3.5, Changjie is difficult to learn and easy to forget. Some Chinese characters can be written in different forms, so it often happens that Changjie experts may switch to the “Simple and easy” method occasionally when they come across difficult words. But for David, even though he reported using Changjie in the first survey, he did not regard himself a constant Changjie user, so he reported using “Simple and Easy” in the last two surveys. In summary, David could be regarded as a relatively expert user of computers, but not so expert in Chinese input methods.

7.5 PERCEPTIONS OF HIS OWN IT SKILLS

David was interested in computers and had taken a 120-hour advanced course in computers. He had high regard for himself, and very high perceptions about his abilities in IT skills. In the first survey before the study, he scored 35, and ranked second in the whole school, with three points less than the highest scoring teacher in the perceptions of his own IT skills (See Table 7.1). He claimed that he could perform expertly when inserting tables and graphics in a word-processed file, when using and developing Microsoft PowerPoint® files, and when using the Internet and email. He also claimed that he knew all the tricks of formatting a hard disk. He said he was rather good at assembling computers from components and installing software when it was necessary to do so. He considered himself good at using Microsoft Word® and Microsoft Excel®, scanners and using computers to develop graphics and other applications. But when he was probed in the interview about database and programming skills, he admitted he had only some knowledge of these applications.

David was the first IT Team member to teach his colleagues...
word-processing using Microsoft Word® and presentation software using Microsoft PowerPoint® at the 2000-2001 school-based training sessions. He also attended the training session himself. After teaching and being taught by his colleagues, David’s perception about his abilities in IT remained at the highest level for skills like formatting a hard disk, inserting tables and graphics in a Microsoft Word® document, designing and using Microsoft PowerPoint® presentations, and using emails. He believed his abilities in using Microsoft Word® and Microsoft Excel®, scanners and computers for graphics and music had increased from the quite good level to the expert level. His abilities in using a database program and to write computer programs had also increased from the novice level to the quite good level. However, his abilities in assembling computers and installing software remained at the quite good level, and his ability in using the Internet dropped from the expert to the quite good level. His total score was 40 out of 45, and he ranked first among all the teachers.

In the last survey at the end of the two-year study, David reported decreases in his perceptions of all his abilities from expert to quite good except database program usage, where he dropped from quite good to limited knowledge. David’s aggregate score of perception about his abilities in IT dropped considerably from 40 to 29. However, as more than half of the teachers revealed a drop in the perceptions, he and two other teachers retained a high ranking, second, after the highest score of 37 reported by the new IT Coordinator-elect.
Table 7.1

*David’s perception of his own IT skills*

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Format a hard disk</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Insert tables in word-processor (Microsoft Word®)</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Insert graphics in word-processor (Microsoft Word®)</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use presentation software (Microsoft PowerPoint®)</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Design presentation software (Microsoft PowerPoint®)</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use email</td>
</tr>
<tr>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Use the Internet (Microsoft Internet Explorer®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use word-processor (Microsoft Word®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use a spreadsheet program (Microsoft Excel®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use a scanner</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use computers for graphics and music</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Set up computer hardware</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Set up computer software</td>
</tr>
<tr>
<td>1 (Some)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Write computer programs</td>
</tr>
<tr>
<td>1 (Some)</td>
<td>2 (Good)</td>
<td>1 (Some)</td>
<td>Use a database program</td>
</tr>
</tbody>
</table>

35 40 29 Total

Key to the codes:
0: Does not have that skill
1: Has some knowledge about that skill
2: Is satisfactory in using that skill
3: Has expert knowledge in using that skill

7.5.1 DAVID’S EXPLANATION ON THE CHANGES IN PERCEPTIONS OF HIS OWN IT SKILLS

When prompted about the decrease in the perceptions of his IT skills, David gave three reasons. He first attributed the general teachers’ decrease in using IT in teaching to the fact that teachers were not as intensely eager as in the first year (Db: 26). In the first year of the program, teachers were eager because they planned as part of the school-based program; however, having acquired sufficient skills for the accredited competence required by the EMB, there was less interest in pursuing more topics. Teachers felt that they were competent, and hence David believed that they had become used to using IT and had lost interest in pursuing any new innovations in that area.

Second, David attributed some teachers’ decrease in using IT in teaching
to the busy workload. David explained that, in the first year, since he had just
finished the 120-hour training, IT was very familiar to him, so he had more
confidence. But teachers had a lot of other things to pay attention to. For
example, during the year 2001-2002 he was reassigned from the IT team to
curriculum development (Dc: 9:40).

Third, because he did not use IT as much in the second year as in the first
year, he felt he lacked practice and reinforcement of the use of strategies. He
was not confident and therefore selected a lower option (Dc: 8:50).

When David was asked whether the abilities of the IT team members,
especially the younger teachers, decreased as shown from the analysis, he
thought their abilities would not be lower because they were all taking IT
courses themselves. He pointed out that fellow teachers, Rossi and Manfred,
who were also studying advanced courses in computers. He questioned how
these teachers’ abilities could become lower. He compared his own level of
knowledge and use with that of two years previously, and found his level had
progressed. To give a reason why these teachers selected a lower option in the
final questionnaire survey, David attributed teachers’ selection of the top but
one option as the Chinese philosophy because Chinese people often understate
their abilities (Dc: 32:40). He would not admit he was expert in the area unless
he was fully confident. As he felt a bit uneasy, he chose the lower option
(27:00). David’s explanation is justified by Lao-Tzu’s philosophy which has
great influence on Chinese behaviours as informed by literature in Section
2.7.1.7.

When David was asked about the large increase in the female teachers’
perceptions of their IT skills and self-efficacy compared with the small increase
or decrease in the male teachers’ perceptions, he explained that the female
teachers were beginners at very low starting levels, therefore, there was much
more space for them to enhance their perceptions of skills and self-efficacy
while the male teachers were already at a rather high level of abilities initially.
It would be more difficult for them to appreciate any significant enhancement
(Dc: 14:40). David’s view is supported by other teachers such as Flora (Section
8.4.2).
On the question why there was no paradigm shift in teaching observed during these two years of study, David offered three explanations.

No. There is no paradigm shift. Firstly the workload is high. Secondly, teachers’ skills and techniques have not reached the level which can produce a teaching material which has animations, rich in content, and it may take a lot of time doing this job to be presented in only one period of the class. Thirdly, the effectiveness is not very high. Those produced by the publishers may not meet the requirements of the teachers. Publishers do produce a lot of software, but they are not on the same level as the teachers. Even though some publishers ask teachers to help developing the teaching materials, they are useful only to the schools of these teachers. It is impossible to fit all schools. It is very difficult to accomplish. You have to save up. The publishers too have to save up. You cannot use the same software every year. Their difficulty is to change all the time. Every year there is something new so that teachers can have a choice to select this set or that set to teach the same thing. But the cost will be high. But this is the direction. After saving four or five years, you may have accumulated many pieces of software for the same topic so that you can have a choice (Dc: 21:50).

From these arguments, David’s view of teaching was teacher-centred. As the novelty and fanciness of IT faded away, David believed direct teaching was the most effective way of teaching.

In the first year, everything was new. So everyone tried to use IT. In the second year, I felt that IT seemed to be an obstacle. You have to find something before you can use IT, and the results seemed not so achieving. Very often the tradition way of teaching has its advantages. In a very short time, students can absorb a lot of things. But if you use software, it must match the content to be taught very much and the results are not so successful. The software, I think, may be better for them to learn by themselves, which is more practical. Probably it’s better to use direct teaching in the class and use the software as consolidation. I feel IT should be used this way. So I actually used less last year (Dc: 5:45).

7.6 DAVID’S SELF-EFFICACY IN USING IT IN TEACHING

In the first survey before the study, David already reported rather high scores in self-efficacy in using IT in teaching (See Table 7.2). In response to those questions that probed his confidence in the general use of computers, he claimed that he was quite confident in the use of this technology. However, he did not believe that he had sufficient computer knowledge and skills to use computers effectively in teaching in the classroom. He was also undecided if he knew how to get students to use computers to study, and did not feel it difficult to advise students how to use computers in their study. He could not affirm that he knew how to manage effectively the learning environment for the use of
computers in the classroom. During his interviews, David discussed a range of technical issues related to the use of IT in a classroom situation. His focus was primarily on how IT can support teaching by providing opportunities for increased student engagement:

For example, I post up some questions on the web and ask students to surf the web and answer the questions, and then we’ll discuss the answers in class. I think it will be better this way. I don’t believe IT can enhance teaching efficiency. It is one of the teaching techniques only. When you refer to efficiency, what I said about writing and erasing the chalkboard, then it can enhance the efficiency. I believe that, unless the software is excellent, the effectiveness may not be as good as direct teaching (Dc: 17:50).

He was concerned with the quality of software, believing that it “would not enhance their thinking” because the content was “too simple”. To make it useful and interactive, he would need considerable time to locate appropriate material or to develop software which might only be used on one occasion (Dc: 19:20).

The disadvantage is that if I really want to make it interactive, I need to spend lots of time before hand, such as looking for software. I always think I need to spend lots of time to develop a Microsoft PowerPoint® for one lesson, however it will become disused afterward. I would think what I gain is not in direct proportion to what I contribute (Da: 6).

His personal efficacy when using IT in teaching was already high, compared with the average score of 30.97 for all the teachers. He scored 40 out of a maximum full score of 55 and was just next to the teacher with the highest score of 48.

After trialling the use of IT in his teaching of Computer Literacy, English, General Studies and Mathematics, David’s personal self-efficacy on using computers and IT, and IT in teaching rose to a score of 52, which is consistent with his perceptions of his own IT skills. He continued to express confidence in using computers in general, and a belief that he knew the steps to use computers “effectively” as a tool to aid teaching and knew how to manage the learning environment for the use of computers in the classroom. He felt more confident in being able to answer students’ questions relating to using computers in their study. However, he still expressed less confidence in using computers as an assisting teaching tool to motivate and facilitate student learning in the classroom.
Table 7.2

David’s self-efficacy in using IT in teaching.

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>SA</td>
<td>A</td>
<td>I’m not afraid of using computers</td>
</tr>
<tr>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>I have confidence in using computers at work</td>
</tr>
<tr>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>I know how to follow the steps to use computer effectively as tool to aid teaching</td>
</tr>
<tr>
<td>A</td>
<td>SA</td>
<td>A</td>
<td>I can always answer students’ questions relating to using computers in study</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>I have already had sufficient computer knowledge and skills to use computers in teaching</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>I am satisfied with my results of using IT in teaching</td>
</tr>
<tr>
<td>N</td>
<td>SA</td>
<td>A</td>
<td>I know how to manage effectively the learning environment for the use of computers in the classroom</td>
</tr>
<tr>
<td>N</td>
<td>SA</td>
<td>A</td>
<td>I know how to get students use computers to study</td>
</tr>
<tr>
<td>N</td>
<td>SA</td>
<td>A</td>
<td>I don’t feel difficult to advise students how to use computers in their study</td>
</tr>
<tr>
<td>N</td>
<td>SA</td>
<td>A</td>
<td>I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom</td>
</tr>
<tr>
<td>N</td>
<td>A</td>
<td>A</td>
<td>I am often able to use computers effectively as an assisting teaching tool in the classroom</td>
</tr>
</tbody>
</table>

40 52 44 Total

Key to the codes: SA: Strongly Agreed (5); A: Agreed (4); N: Neutral (3); D: Disagreed (2); SD: Strongly Disagreed (1)

It may not be more effective (beneficial) than taking the book and let students do exercise. But computers can bring them interest. On the contrary, many teachers use those for the English language, because those from the publishers can arouse interest, the process will attain the requirement (by ED of using 25%). At least kids will be benefited. It may be more effective than conventional method (Db: 1).

His view of IT in teaching also referred to facilitation of examination preparation.

We have the Intranet, and we can upload the past examination papers, exercises, etc. to let students browse spontaneously. It will help teachers more on the use of IT in teaching. It will become a trend or a common model (Db: 4).

David and another teacher both scored 52 out of a maximum score of 55, and both ranked first among their colleagues. There was a big increase in his score, from 40 before the trial to 52 after 27 weeks. In fact, the average personal efficacy score of teachers of the whole school had also increased from 30.97 to 38.50, indicating the training sessions and trial teaching had a positive effect on teachers’ efficacy beliefs. David’s increase was higher than the average increase of teachers. As a teacher good at IT, David could gain more
performance accomplishment (Bandura, 1977b) in using IT than other teachers who had less knowledge and skills, and thus lower perceptions of IT skills as well as self-efficacy.

At the end of the second year, David’s personal rating of self-efficacy in using IT in teaching dropped from “Strongly Agreed” to “Agreed”. He perceived himself as not being afraid of using computers and having the confidence to use computers at work. He had quite good computer knowledge and skills to use computers in teaching in the classroom and was able to manage the learning environment for the use of computers in teaching reasonably well. He felt frustrated with the huge amount of time required to spend on developing teaching materials (Da: 6 and researcher’s field note on conversation with David). When he was not nominated for the ITC job, he lost interest in promoting IT in teaching, although he still had the capacity and duty to do so. He believed that his knowledge, skills and abilities had improved. When he tried to tackle more advanced applications, he met more difficulties; therefore he thought he could not claim “expert”, but put himself in an upper middle position. His score was 44. He was still more efficacious compared with other teachers, so he was able to rank fourth among the teachers.

7.7 DAVID’S PATTERNS OF TEACHING PRACTICE WITH IT

Information about strategies incorporating IT in teaching of various subjects extracted from the data recorded by David in weekly timetable reports are summarised in Table 7.3 and discussed in the follow section.

7.7.1 PATTERNS OF TEACHING PRACTICE IN THE FIRST YEAR

In the academic year 2000 to 2001, David taught 27 periods of 35 minutes duration per week. There was also a double period (70 minutes) on Tuesday afternoons from 2:05 to 3:15 for weekly meetings and activities, and the last period on Friday afternoon for Teaching Research and regular meetings. In the 27 week timetable reports of applications of IT in teaching, David used a variety of strategies totalling 317 in 102 periods when the Computer Literacy course was included.
7.7.1.1 COMPUTER LITERACY

David taught five classes of Computer Literacy. Although there was only one period for each class, it was in this subject that he used IT most: a total of 95 periods out of 102 periods, which was quite natural because both students and teachers would expect a Computer Literacy subject to involve computers and the networked environment. In general, each class had about 19 periods using IT. Although David was a younger teacher who was good at IT, his pedagogical approach was teacher-centred, so his strategies were mostly computer presentations using Microsoft PowerPoint® files either developed by him or provided by the textbook publishers. He controlled the Microsoft PowerPoint® by himself 71 times and asked students to control the slides for him while he was teaching 82 times. He claimed that he used IT as a motivation tool 49 times and as an aid for explanation 16 times. David believed that students would be motivated by using IT with graphic display and sound effects as it was a new experience to them, and teachers could use the graphics, video clips and animations to help explain the terms, facts and theories. He also used 23 lessons to allow his students to work on their projects. He tried to build up a collaborative knowledge-building environment in 28 occasions in the teaching of computer awareness and skills. The patterns he used were mainly creating a learning environment by showing some slides, first controlled by him as motivation and teaching, then controlled by the students to aid learning, with explanation and collaborative knowledge building. From the pattern, David’s interpretation of collaborative knowledge building seemed to be mainly through using questions from the teacher and answers from the students with discussions about the content of the Microsoft PowerPoint® slides; from here he believed that students could build their knowledge through discussion in the class (collaboration). He then put students in groups for project development. These projects generally were set assignments. Later in the year, he just took students to the computer room and let them develop their own projects (Researcher’s note: As found in Sections 4.3.3.1 and 4.3.3.2, teachers at Philanthropy Primary School had to follow the tight teaching schedule). Teachers and students usually followed the textbook which had worksheets for each lesson. The teacher might ask students to do certain projects using the
computer programs, like writing some flyers when they learned word-processing, some Microsoft PowerPoint® slides about interesting topics when they learned Microsoft PowerPoint®. David allowed students to play with computers as a reward for finishing the assigned work early. When students finished their assigned work (e.g. worksheets in the textbook), they were allowed to surf the Internet, or play certain computer games.

As it is expected that Computer Literacy will use IT, so in the following analysis, Computer Literacy will be left out. David’s applications of strategies incorporating IT in teaching other subjects in the first year became very few, compared with that in Computer Literacy.

7.7.1.2 ENGLISH

David taught seven periods of English language plus one period of English dictation and one period of tutorial for the Primary Two class per week. He had tried using IT in teaching English on only two occasions. In the first week of the trial of using IT in teaching, he used only one strategy: using a Microsoft PowerPoint® presentation as a teaching aid, and controlled the flow of the lesson by displaying the slides himself. In week 22, he tried using three strategies incorporating IT in his teaching of 2C again. He showed the presentation at first by himself. Then he asked students to come out and operate the presentation in front of the class. Later he asked students to work on their own assignments.

7.7.1.3 GENERAL STUDIES

David met his students five times per week for General Studies. He used IT in teaching General Studies on two occasions over the 27 weeks. The strategies he used were mainly showing ETV CD-ROMs to students and videos as an aid to help explain the contents of the textbook to the students.

7.7.1.4 MATHEMATICS

David had seven periods of mathematics plus one tutorial period per week, but he used IT in two periods only. In a lesson in week three, he developed a Microsoft PowerPoint® file on the topic of division. It was a simple transformation for displaying the division in horizontal and vertical formats.
using the computer display projector instead of writing on the blackboard. He intended to use the technology as a tool to motivate the students. He controlled the display once and asked students to come and control the display concurrently while he was teaching. He then asked the students who were weak in the topic to try and reinforce their learning through operating the slides. This approach suggested his way of teaching was influenced by technical issues rather than pedagogical principles. Given that teachers were new to the application of IT in teaching, the first attempt augmented their normal practice.

The second time David used IT in his teaching of mathematics was in week 15. He used a file provided by the textbook publisher. It displayed a ten-column table used to show factors of different numbers and primes. He first showed the file, he then asked students to come out and try the program. Students in the class shared their experiences and discussed collaboratively through trying different values, using Teacher Asks-Students Respond model. He then asked students to work on their own project to find factors for different numbers individually and observe the patterns on the ten-column table themselves.

David believed that the innovative use of Microsoft PowerPoint® files could arouse students’ interest, and the dullest topic could be presented in a more interesting and motivating way by using IT to present rather than by chalk and talk. He also believed that presentations saved time compared to writing and erasing on the chalkboard. (Researcher’s field note: conversation with David).
Table 7.3
Record of David's use of strategies incorporating IT in teaching, with and without Computer Literacy (CL).

<table>
<thead>
<tr>
<th></th>
<th>00-01 with CL</th>
<th>00-01 No CL</th>
<th>01-02 with CL</th>
<th>01-02 No CL</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>4</td>
<td>10</td>
<td></td>
<td></td>
<td>Presentation controlled by teacher</td>
</tr>
<tr>
<td>85</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
<td>Presentation controlled by students</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
<td>Motivation</td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
<td>Explanation</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
<td>ETV</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
<td>Learning situation</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td>Remedial</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Reward</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Rotate Groups</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Small Groups</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>4</td>
<td></td>
<td></td>
<td>Computer Room</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td>Project Development</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Project Presentation</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Information Tool</td>
</tr>
<tr>
<td>29</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td>Collaborative Knowledge Building</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>VCD</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Using Projector</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Web resource / Internet</td>
</tr>
<tr>
<td>317</td>
<td>18</td>
<td>55</td>
<td></td>
<td></td>
<td>Total number of strategies</td>
</tr>
<tr>
<td>12.68</td>
<td>0.72</td>
<td>1.72</td>
<td></td>
<td></td>
<td>Mean no. of strategies per week in each year</td>
</tr>
<tr>
<td>102</td>
<td>7</td>
<td>26</td>
<td></td>
<td></td>
<td>Total number of periods using IT in teaching</td>
</tr>
<tr>
<td>4.08</td>
<td>0.28</td>
<td>0.81</td>
<td></td>
<td></td>
<td>Mean no. of periods using IT per week in each year</td>
</tr>
<tr>
<td>3.11</td>
<td>2.57</td>
<td>2.12</td>
<td></td>
<td></td>
<td>Mean no. of strategies per period</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
<td>22</td>
<td></td>
<td></td>
<td>Total number of weeks using IT in teaching</td>
</tr>
<tr>
<td>0.80</td>
<td>0.24</td>
<td>0.69</td>
<td></td>
<td></td>
<td>Mean no. of weeks using IT per week in each year</td>
</tr>
</tbody>
</table>

7.7.2 PATTERN OF TEACHING PRACTICE IN THE SECOND YEAR

David had a relatively light teaching load in the year 2001 to 2002. He taught English language, Mathematics, and Physical Education. He taught a total of 21 periods per week, plus one period of Teaching Research regular meeting and a double period of weekly meetings or activities. As an IT team member, he was given spare time and was supposed to help the teachers with IT in teaching.
7.7.2.1 ENGLISH

David had eight periods of English language plus one tutorial per week. He used IT in teaching the subject on 15 occasions. He used Microsoft PowerPoint® presentations to create a learning environment to motivate the students and help explanation. He would control the presentation once, and asked students to control for him while he was explaining the main points. His teaching method in English was rather didactic, more teacher-centred than student-centred.

7.7.2.2 MATHEMATICS

David met the class seven times for Mathematics and for one tutorial per week. He taught mathematics with IT in 13 occasions. He mainly used the episodes from the Education TV to motivate and explain to the students. He also took the students to the computer room to do projects in three occasions.

When David was prompted about why IT was not used much in the second year, he said that in the first year, everything was new and everyone tried to learn something in teaching, so they tried to use IT in their teaching. In the second year, David felt IT was an obstacle to “effective” teaching (Dc: 5:40). He stated that the teaching materials were too easy and could be used only for a few minutes of teaching in the class, but it took a lot of time to set things up. He thought that the software could not motivate students’ interests because students’ demands on the teaching materials had increased as more teachers used IT (Dc: 19:20). Very often, students knew the answers before the teachers played the program because the answers were so obvious, especially for those students who did previews from their textbook before the lessons. He thought the software on the market could not motivate students’ interests, except for a small number of very good software items. Whether students had learned anything after having fun with the programs was a question (Dc: 19:20). David perceived IT as an effective tool only for students to learn by themselves after the class. He believed that direct teaching is most effective, it can teach a lot in a very short time (Dc: 6:00). IT can save teachers’ time only for writing and erasing the chalkboard through putting the main points in the Microsoft PowerPoint® slides (Dc: 7:00). He thought the incentive for using IT in
teaching was convenience. Some teachers use OHPs and others use visualisers, David used Microsoft PowerPoint® instead. He keyed in the questions, discussed them in the class, and found it a great time saver (Dc: 18:30).

When David was asked why student projects were not used much, he argued that firstly, not many students had a computer at home, and secondly, they did not have software, such as Microsoft Office®, PhotoImpact® or other programs. Trial versions that came with the computers soon expired. A licensed copy of Microsoft Office® costs between two and three thousand dollars to buy. This is a large portion of the price of the computer hardware. When a teacher asked students to use Microsoft Word®, Microsoft Excel® or Microsoft PowerPoint®, they did not have the program. Teachers would not give students a large project because students do not have computer hardware and software. Some teachers let students do their project in the class, and tried to open the computer rooms after school, but there were so many activities such as the Education Department initiated project “IT Fun! Fun! Fun!” which occupied the computers in the computer room and MMLC (Dc: 13:10).

David admitted that he rarely used PowerPoint® to develop teaching programs because of the considerable time needed to produce a presentation of just 10 slides which required little time to show. After showing the slide it was still necessary for students to resort to using the text book. From his perspective there was no advantage in using PowerPoint® other than to develop worksheets.

In summary, David used IT in teaching in a rather traditional fashion. Although he was a young teacher, eager to use IT in teaching, his mindset was centred on the teacher-led, instillation approach. Because the lessons in Hong Kong are examination oriented and content driven, teachers have to finish teaching the prescribed contents or topics scheduled for each lesson. They often put the content in Microsoft PowerPoint® slides and go through them in class, which serves as using IT in teaching. It is really using IT for IT’s sake, and just to show that the teacher has used IT and to fulfil the requirement. Teachers in Philanthropy Primary School (Sections 8.7.2.2, and 9.10) share similar views. There was little evidence of student-centred, contemporary constructivist approaches in David’s teaching. That may explain why he found using IT in
teaching not as useful as he formerly thought, as the novelty effect of IT faded slowly over time.

7.8 DAVID’S VIEWS ON SCHOOL-BASED TRAINING

David reflected that the tutors were good change agents because they were more knowledgeable (heterophily) but shared the same common characteristics as a teacher (homophily) and could be able to take the roles (empathy) of the teachers (Rogers, 1995). They knew the levels of their fellow teachers and used the examples which were common among themselves.

The school-based training sessions was very helpful. Teachers liked them very much. They liked us to teach. If they are taught by people outside, they would learn something very technical, which might not match the level of what teachers wanted to learn. When we teach, we always use practical examples like designing worksheets and we would tell them what to pay attention to. I think teachers in other schools are taught by people outside that school, not like us who are taught by our teachers. It (training taught by fellow teachers) is very helpful. But IT team members have to prepare themselves (Dc: 31:00).

David’s interview demonstrates that he believed his teaching with IT was successful, because he found students concentrated and became involved (Da: 39). He thought that all teachers at the school wanted to learn (to use IT) (Da: 66) but had changed their minds about using IT in teaching (Da: 91). In the past, his colleagues did not take any action in using IT because they were not confident, but now the situation had changed a lot. He could see many of his colleagues were willing to ask questions about how to use IT and this impacted on their willingness to uptake IT as cited in the following comment.

In the past, my colleagues did not take any action, but now the situation has changed a lot. I can see a lot of colleagues are willing to ask questions. But the main problems are that we know too little about the reality outside. There may be too much blame and wonder whether we have done too much? Why? Why the expectation outside the school is very different from ours? Are we going too fast? (Da: 91).

However, he was concerned that teachers would forget all about using IT in teaching after learning about it because they did not reinforce their knowledge by regular use (Da: 25). He said that he and his colleagues were not afraid to use software if they had access to suitable packages, but the process of lesson design and preparation was really tough (Da: 44). Preparation was time intensive (Da: 42). However, teachers lacked time to spend on thinking and
preparation of IT based lessons (Da: 67).

7.8.1 WHY DAVID WANTED TO USE IT IN TEACHING

David saw IT as something new, so he wanted to try it. Secondly, he thought using IT in teaching would become normal practice in the future, as he agreed strongly in his first and second questionnaire surveys. He wanted to keep abreast of developments and was afraid he might be left behind if he did not follow the trend (Da: 22, 23). David also noticed that the students found using IT innovative, and IT could stimulate their interest.

Students find it innovative; IT gives them some interest; they are willing to listen; they find what we said new; they will listen carefully and will not feel dull; they have great interest, great interest in looking at everything. .. IT is interactive; Using Microsoft PowerPoint® saves a lot of time writing on the blackboard. (Da: 4).

Whenever the teachers announced that computers were to be used, students would be very excited, and greatly interested in looking at everything when they were led to the MMLC or computer room. David believed that using Microsoft PowerPoint® could save a lot of time that was wasted in writing on the blackboard and erasing them. He claimed that IT was interactive, and hoped to use IT to help students to understand and learn easily (Da: 4). He argued that not every teacher had the talent of using chalk and talk to teach vividly like a talk show star, and to use computers as a medium could help improve the outcomes of teaching (Da: 82). Given this interpretation of David’s motivation, although he was technologically competent, his focus on supporting other teachers to develop the skills of using IT in teaching was limited. In Section 2.8.4, Rogers’ (1995) diffusion model was discussed and the importance that change agent need to be aware of their clients’ needs (Section 2.8.4.7.1). Hence although an early adopter, David was not an influential change agent.

7.8.2 THE MOST IMPORTANT FACTOR THAT DRIVES TEACHERS TO USE IT IN TEACHING

David thought the most important factor encouraging him to use IT was his own heart (mind) to try to teach well, which was what people often refer to as “mission”. He found that the hearts (minds) of the teachers had already been changing slowly. He believed that the teachers needed to know more about the environment outside the school so that they could compare their own pace of
development with those from other schools (Da: 88-90).

7.8.3 PROBLEMS OF USING IT IN TEACHING

David’s mindset demonstrates the traditional pedagogical approach. Teachers were viewed as dispensers of knowledge, so they had to prepare teaching materials and learn how to use the software to help the development of children. The problems he saw were related to this kind of teaching approach.

7.8.3.1 TIME FOR MICROSOFT POWERPOINT® SLIDE DEVELOPMENT

IT to David was a novel way that he could use to attract the students’ interest and motivate them to listen, as pointed out in previous sections. So his intention (and those of other teachers) was to develop Microsoft PowerPoint® presentation slides to be used in the class. But to develop interactive Microsoft PowerPoint® slides takes a lot of time to plan and design, so he pointed out that the long preparation time was a big problem. He said that the most difficult point was to apply what he had learnt to teaching, rather than the skill or concept itself. He could not just convert the content of the textbook into Microsoft PowerPoint® format and use it in teaching (Da: 35-36). The instructional design process associated with developing the Microsoft PowerPoint® was the most difficult. He stressed that it took him a very long time to work out (think) how to do it, and then he was not always successful. Compiling the material was not that time consuming (Da: 40-43, Da: 6).

David acknowledged that not every lesson was suitable for using IT in teaching, and there was not enough time for preparation, as mentioned above. He also believed that the Microsoft PowerPoint® slides that were time consuming to develop were used only for one lesson. So what he gained was not in direct proportion to what he contributed (Da: 6).

7.8.3.2 FAMILIARISATION OF OTHER TEACHERS’ TEACHING SOFTWARE

David believed that, when a teacher received a software package, he/she needed to spend time studying it in order to understand its objectives and know how to use it (Da: 45). He also thought that teachers should spend more time examining other people’s software, and learn from them. Sharing would provide more opportunities to develop new ideas. Looking continuously for
good teaching materials could transform others’ good ideas into one’s own material (Da: 84).

7.8.3.3 PROBLEMS IN THE CLASSROOM

David believed that when teachers tried to use IT in teaching in the classrooms with computer and projectors, there were two problems they would frequently encounter.

First, teachers needed to prepare themselves thoroughly because the technician would set up the computer and then leave. If teachers were not familiar with the functions of the equipment, they would not know which part of the setting caused the problem even if the problem was trivial (Da: 59). When teachers were using their own computers, there would be fewer problems because they were familiar with them. However, when they were using the computer in the classrooms, they would find it more difficult (Da: 53-54). In fact, there was often incompatibility with hardware and software in the Windows system. If the drawing tablet was not used properly, the computer hung and would need someone to fix it (Da: 60).

Second, sometimes teachers would take students to the smaller computer room where there were fewer computers, less than one computer per student. The usual arrangement was two students per computer and the problem of equity in access occurred. David found that there were students who never used computers in class because their partners occupied the computer all the time (Da: 65)

7.8.3.4 PROBLEMS IN THE INFRASTRUCTURE

David revealed a management problem related to the network system when teachers used IT in teaching. The storage folders were not allocated to individual students but to the whole class. Any student could login, save and delete files. Those students who knew how to save just saved all the things, including games, into the folders and used up the memory, leaving no space for other students. It confirmed Flora’s complaint that her students could not save after working for hours, and the students became frustrated (Section 8.6.1). Some students could even delete other students’ assignments to create more space for their files, causing many problems with student assignments. Some
students had to re-do their assignments (Db: 16-24), confirming Flora’s complaint that her students also lost their work (Section 8.6.1)

7.9 DAVID’S VIEWS ON PAR

Though teachers were allocated to eight PAR groups, David found later that there were problems with the grouping. There were great differences in IT abilities within the group that made sharing difficult. David commented:

some of the teachers did not have enough computer knowledge and skills, thus they could not express themselves precisely and did not know how to contribute to the discussion, and sometimes they might raise some ideas which they did not know how to do (Da: 7).

Sometimes, teachers suggested ideas which they were unable to implement because of a lack of expertise. There were only a few IT competent teachers at Philanthropy Primary School, and besides forming the IT Team, they were assigned to different PAR groups by the principal. It was apparently easy to assign leaders for groups of major subjects because of the availability of potentially suitable staff. However, for specialist small subjects such as music or art, it was more difficult to allocate a leader. Usually teachers with some experience would be considered. So, although David was a mathematics and English language teacher, the principal put him in charge of the Art PAR group because he did Chinese painting himself as a hobby (Da: 11-13). Since David was not an art teacher, he could only help with the technical aspects, not on how to use IT in the teaching of subject matter of Art (Da: 13, 27).

A contentious issue among teachers was the need to maintain a timetable reporting the use of IT. When David was asked about the usefulness of returning the timetable, his opinion was similar to that of Flora (Section 8.9) in that teachers would feel obliged to do something to avoid handing in blank timetables for three to four weeks. When he was asked how he would do the PAR, he believed that it should not lay down a hard and fast rule for teachers to return the timetable because it became a responsibility of the teachers, and they would act as described previously. He thought that if teachers were allowed to do it once or twice and not so rigidly, it might be more effective. He suggested that the IT team members should record the opinions of participating teachers during the PAR meeting and share this information among all teachers. These
small group discussions often revealed problems that were similar to other teachers’ concerns (Dc: 29:00).

7.10 DAVID’S BELIEFS EXPRESSED IN HIS PORTFOLIO

David was required to compile a portfolio and email it to his principal for verification and record keeping. He put four documents in the portfolio, namely, personal views on IT in education, the advantages and disadvantages of using IT in teaching, application of computers in teaching network, and a lesson plan, together with a Microsoft PowerPoint® presentation file and a web page. The following section summarises these documents.

7.10.1 RATIONALE IN USING IT

In his “Personal Views on IT Education”, David pointed out that, as the information networks can link the whole world very quickly, it brings great influences and impacts society. If students cannot master IT knowledge and skills, they cannot deal with the changes in the information society. He advocated the application of IT in teaching and learning.

He believed that multimedia computers could provide not only texts and graphics, but also sound, animation, movies, and simulated 3D objects. He argued that, for students at Piaget’s Concrete Operational stage, these concrete and vivid media can not only motivate their interest to learn, but also foster high level abilities and help them in independent study. He recognized teachers’ need to face positively the paradigm shift and became a willing promoter. He believed that teachers should equip themselves actively by taking training courses to learn and master new tools, models and skills.

He thought that the traditional way in which teachers worked independently on their own subjects was no longer possible because it took too much time to develop teaching materials.

His mindset was initially dominated by a very distinctive role for teachers and students. He saw teaching as process of instillation of knowledge through the transmission of information with learning as a process of accumulation of information. However, he recognised that in the era of IT, teachers and learners assumed new roles, as stated in his Personal View on IT Education in Portfolio:
In order to develop students’ self learning ability in this IT era, teachers must understand their roles are no longer the only knowledge provider, but become a facilitator, manager and organiser in the classroom. According to Vygotsky, teachers’ role should be a collaborator, helping students to achieve the highest realm of knowledge, and not just follow the book and preach. As students can acquire different information and knowledge through different channels, teachers should organize and design their own “teaching” to promote students’ “learning”, and through the learning activities, helping students to establish new knowledge.

David maintained the belief that he should contribute to the development of IT-based teaching materials to be used by the teachers in their teaching of the contents prescribed by the schedule. He was keen to ensure that teachers should adopt a culture of collaboration for sharing experiences and professional knowledge, and exchange teaching materials, support and help each other during the shift in teaching culture.

He believed that the students’ role should also change from that of a passive learner to an active knowledge constructor, learning manager and life-long learner. Students cannot receive information passively as in the past. On the contrary, they should learn how to actively analyse and integrate information. They would have more choice and be better informed about what to study (Rationale, from David’s Portfolio).

7.10.2 THE ADVANTAGES OF USING IT IN TEACHING

David commented about the advantages and disadvantages of IT in education in his portfolio. The following list of the advantages was written by David in Chinese and translated into English by the researcher.

- Students can get access to unlimited knowledge through network resources and CD-ROMs on the market.
- Incorporating IT in teaching can enhance the motivation to learn.
- Through resources on the web, teachers can select the latest and richest content to teach in the class.
- The multimedia software available on the market incorporates several media, like sound, picture, animation, movie clips, 3D action graphics, and so on, so multimedia software can attract students’ interest and stimulate initiative.
- IT in education can provide students with a good learning environment.

- IT in education enables teachers to look after students with individual differences more effectively, for example, it can provide appropriate challenges for gifted students and can assist weaker students.

- Learning through the Internet and Intranet will enhance students’ collaboration. They can construct their personal knowledge through discussion and communication.

- Students can upload their learning products to the Internet, which will increase their confidence and positive interest, foster students’ abilities in independent learning, and promote life-long learning.

- IT in teaching doubtlessly makes classroom teaching more vivid, and saves a lot of teachers’ teaching time. They do not need to copy the contents of the topics on the blackboard and then erase later. Using computer assisted teaching saves a lot of time. Teachers need only put the teaching content on Microsoft PowerPoint® slides and then implement the program. The teaching becomes effective and the teaching progress can be enhanced.

- IT in teaching can provide students with a new stimulus, which can increase the interactive learning and teaching.

- Through using IT to make classroom teaching lively; students find innovative computer teaching novel, hence in the learning process, they become very attentive and deeply involved.

### 7.10.3 THE DISADVANTAGES OF USING IT IN TEACHING

The following list of disadvantages of using IT in teaching was also extracted from David’s portfolio and translated into English by the researcher.

- Faults of the hardware and peripherals often leave teachers at a loss and helpless, which might seriously affect the progress of teaching.

- Teachers require a huge amount of time to develop teaching materials.

- Using IT in teaching may limit the development of students’ social abilities, affecting their interpersonal skills.
• Good teaching programs are highly sought after. It requires expertise to develop computer-assisted teaching programs. The programmers need to know not only how to compile teaching materials, but should also have profound knowledge of teaching theories and principles (Researcher’s note: David meant that Using IT in teaching requires high quality teaching programs relevant to the subject matter which are difficult to acquire, hence the quality of the lesson may be suffered due to the lack of quality).

• It is hard to raise the huge amount of funding for the purchase and maintenance of the computers and peripherals.

7.11 DAVID’S VIEWS ON THE ACTUAL IMPLEMENTATION OF THE STUDY

During the interviews, David revealed some views and experiences related to the actual implementation of IT in teaching and learning at the school, which are worth noting.

7.11.1 WHY TEACHERS DID NOT USE IT MUCH IN TEACHING

David complained that the teaching of school subjects like English, Mathematics, General Studies and Computer Literacy was rushed. Sometimes he had to calculate how much time he should draw from his teaching to use IT (Db: 1). David had become concerned that students were not being challenged because the software is inappropriate.

The content of the software cannot really motivate students’ interests. Students’ demand on the software increased, and the software is not able to enhance their thinking. The content is too simple. They may know what it is for before you use the software. They have already understood. Even if you continue to use, there is not much effect. May be part of the students have prepared before the class, and your software is so simple that they understand already. I think the software in the market cannot raise their interests, except some games which have some cartoon figures jumping and moving, giving them some fun. Whether they have learned anything after being fun is really a question. Software is the main concern (Dc: 19:20).

By the time of the third interview, he began to look at IT in a different way. He thought that it was a waste of time if teachers learn with the students in using IT. He believed that the programs should be left for the students to try at home by themselves because students exploring software in class would use...
up valuable time from the teaching scheduled and hence the teacher would have
to compact the lesson (Dc: 24:00). The effects of the rigid teaching schedule on
teachers’ teaching approach will be discussed in Chapter Eleven, Discussions
and Conclusion.

With his teacher-centred mindset, David believed the effect of using
software might be less effective (beneficial) than taking the book and letting
students do the exercises. But computers could help bring students’ interest. He
saw it likely that teachers used IT for IT’s sake (Db: 2). David said that “many
teachers use those (teaching materials) for the English language, because those
from the publishers can arouse interest, the process will attain the requirements
(of using IT in 25% of their teaching, set by the EMB, noted by the researcher)”
(Db: 1). David argued that if IT is used in the future, there has to be a lot of
time allowance for development of instructional approaches (Db: 4).

David believed that the use of IT in General Studies would be
advantageous. For example, he said,

I believe GS will be better for them. Now I show them more on
“HKEdCity”. Like watching ETV, it is very effective, they will absorb
more. (Db: 1)

This comment reinforces his belief that IT provided opportunities for
students to engage in activities for the purpose of accumulating information.
David stated that IT provides good opportunities for students to pass
examinations because the exercises and past examination papers were uploaded
on the Intranet. Students can browse them spontaneously. Web resources of this
kind may help increase the use of IT in teaching. David believed using web
resources might become a teaching model (Db: 3).

7.12 SUMMARY OF DAVID’S STORY

From the case described above, we can see that the 120-hour advanced
computer course brought David to a higher level of perception and self-efficacy
of using IT in teaching, but he confirmed that the school-based, on-site,
ongoing IT training sessions taught by the peers, PAR and try out program for
using IT in teaching enhanced his perception, self-efficacy and outcome
expectancy when using IT in teaching to a very high level, which was similar to
Ken’s case. Although there was a fall in the level of his perception and
self-efficacy in using IT in teaching at the end of the second year of the study, his levels were still well above that at the commencement of the study. This finding is consistent with that in Ken’s case and provides support that the teachers did increase their perceptions, self-efficacy and outcome expectancy. These evidences inform the indicators of research question two.

David offered two explanations for the decrease in levels of perception, self-efficacy and outcome expectancy at the end of the second year of the study. The first one was that teachers were very busy so that when they learnt a new technique from the training and successfully implemented it, they were satisfied and could not be bothered to explore further techniques. This explanation agrees with the survey results of the HKPTU (Section 5.2.4). As teachers used fewer strategies, some might have felt out of practice, and became less confident and efficacious. This explanation applies to those teachers with low perceptions and self-efficacy. The second explanation applies to the young, IT knowledgeable and skilful teachers. David insisted that their abilities had not decreased. They chose a level next to the expert level because, when they attempted more advanced uses of IT in teaching, they would inevitably come across difficult situations and make mistakes because advanced applications of IT required more demanding knowledge, skills and techniques. Even though their abilities had advanced, they dared not claim expertise any longer. This explanation agrees with the traditional behaviours of Lao-Tzu’s philosophy (Section 2.7.1.7). Many of them chose the next level down, resulting in a drop in perceptions, self-efficacy and outcome expectancy. This is another aspect to be considered in looking at the fall in teachers’ perceptions and self-efficacy.

David’s approach to teaching was very traditional, being examination-oriented, and teacher-centred. He was more focussed on teaching than learning, hence he was very conscious of the teaching schedule and would try very hard to finish his teaching of the prescribed content in the given time schedules. His practice of teaching in the two years was mainly didactic using Microsoft PowerPoint® presentations, CD-ROMs, websites and ETV to assist him in a teacher-centred paradigm by just replacing writing on the chalkboard by Microsoft PowerPoint® slides or video shows. His perception of the advantages
and disadvantages of using IT in teaching revealed in his portfolio centred mainly on an expository approach (Hewit & Whittier, 1997) to teaching. At the beginning of the study, both David and the students were attracted by the novelty effect of IT. So he believed that everything could be taught using Microsoft PowerPoint® presentations. As the novelty effect faded out, students were no longer eager to see the words flying across the screen, with meaningless sound effects. Additionally, the enormous time required for him to develop Microsoft PowerPoint® presentations, which could last for only a short part of the lesson, was problematic. David perceived using IT to be more of a burden than a useful tool. From his teacher-centred perspective, he argued that direct teaching saved time and was effective in covering the schedules.

For David and other young teachers who don’t have much teaching experience and pedagogical skills but are good in IT knowledge, skills and techniques, the school-based program provided them with an initial stimulation, but in terms of effective use of IT in teaching there is still a long way to go.
CHAPTER 8 FLORA – THE “FRUSTRATED” USER

8.1 CHAPTER OVERVIEW

Not all teachers reported enhancements in their sense of self-efficacy in using computers. Flora is one such teacher whose self-efficacy decreased from a high value. Her initial ranking put her in the top five teachers at the commencement of the study but she reported a drop to around 20th in the second survey at the end of the first year and to below 30th place in the third survey at the end of the second year. In this chapter, as in the previous chapters about Ken and David, Flora’s personal information and training in computers and information technology will be extracted from her surveys and interviews. Her frequency of computer use, perceptions of her IT skills and self-efficacy in using IT in teaching will be analysed from her survey data, with explanations given by her in the interviews. Flora’s patterns of teaching practice with IT in the two years will be extracted from the timetable report data. From her interviews, Flora’s views on school-based training and PAR will also be discussed. Since Flora chose to complete the Basic Information Technology (BIT) Competence for the reasons elaborated in Section 8.3, she did not include the rationale and the pros and cons of using IT in teaching. At the end of the chapter, research question two is examined in the light of Flora’s evidence.

8.2 PERSONAL INFORMATION

Flora is a female teacher in her early thirties. She had worked in industry before becoming a teacher. Flora initially trained to achieve a Certificate of Education qualification (Fa: 22-23) and subsequently obtained a Bachelor of Education degree (Fc: 0:30). The academic year 2000-01 was her first year of teaching which began at the position of Certificate Mistress (CM) at Philanthropy Primary School. Her teaching assignment during the first year of the study included two classes of Chinese, one class of Computer Studies, and one class of General Studies. During the second year, her teaching assignment was similar to the first year, which included two classes of Chinese and one class of General Studies. She did not teach Computer Studies in the second year.
8.3 TRAINING IN COMPUTER AND INFORMATION TECHNOLOGY

Flora, in her preservice course, had taken a module in which she learnt the basic principles of word processing and spreadsheet use (Fa: 21). She acknowledged that she was afraid of using computers before taking the Computer Studies, General Education module, but the experience alleviated her anxiety. She thought the module was successful because it equipped her to prepare examination papers and to access materials from websites which she would use to prepare print materials for students to use independently of a computer (Fa: 24-25).

Flora had taken an advanced computer-training course of 120 hours at the Chinese University of Hong Kong and learnt some advanced techniques like designing web pages before the study (Fc: 9:10). Flora also reported that she had training in word-processing (Microsoft Word®), computer presentation (Microsoft PowerPoint®), CAL (Computer-Assisted-Learning) and SAMS (School Administration and Management System from the Education Department) (Survey 1).

As Flora had taken the 120-hour advanced training course just before the school-based, on-site and on going program, she believed that she had already learnt many areas of IT which were more advanced than those offered in the training sessions provided at the beginning of the study (Fc: 7:07). She believed that these training sessions were designed to provide only basic knowledge and skills which helped teachers to attain the IT Competence levels, and since these sessions were not compulsory, she selectively attended only two sessions (Fa: 33). Since the 120-hour advanced IT course Flora attended was not recognised by the Education Department as a qualified course, she was not exempted from handing in the portfolio. As the training sessions were designed to help teachers learn IT knowledge and skills, and at the same time to attain the Intermediate or Upper Intermediate level of IT Competence (IIT, UIT), there were practical tasks for teachers to do. If teachers found it difficult, they could get help from IT Team members. In fact the content of these training sessions was challenging (Appendices K, L and M). Although Flora was under pressure exerted by the principal to do a UIT portfolio (as she had done a 120-hour
advanced course in IT), she submitted a portfolio at the BIT Level only. She argued that, as a devoted teacher with an independent mind who cared only for the welfare of her students, she had the right to select what she should do.

I think objective was very important. Everyone has her/his objectives when doing a task, but when it is processing in opposite direction with my own objective, as a thoughtful teacher, I have the right to screen what I want or have to do. I can reach the standard of UIT but can you imagine what would happen to my students if I spend such a lot of time on it? I had thought about it. It’s okay if I can really learn something after studying UIT, because I had already learnt in summer. In summer, it was only me, not my students who was affected. It was okay to use my time, but if I use theirs during teaching period, I should consider carefully. I found many teachers having similar views as me, not because they could not but the problem of whether they should or should not (Fa: 46).

She was defiant and argued that although her ability had reached UIT level, it would not be fair to her students if she spent time and effort on doing a UIT portfolio just to fulfil the requirements of the Education Department. Although not quite happy, the principal accepted her portfolio anyway and submitted it to the Education Department. She was the only teacher who attained the BIT level formally.

8.4 FREQUENCY OF USE OF COMPUTERS

Flora reported that she had two computers at home, which she could use interchangeably for different tasks (Fa: 71). Flora could also access computers at school. She had about three to four years of experience using computers and she kept abreast of developments such as changes from Windows 98 to 2000. She was able to search the web and print teaching materials for students well before the study, as mentioned in the previous section. She continued to do so, and used the computers to prepare her lessons in the previous two years. On average, she used computers at least once every day. She was and remained a regular user. She reported using the computer mostly for work although about a third of the time was dedicated to leisure and communications with friends. For work, she used the computer to search for teaching materials or websites, and preparing examination papers and worksheets (Fa: 25; Fc: 0:45). Although Flora believed she was good at IT, she adopted the “simple and easy” method for entering Chinese characters indicating she was not a very professional user of the Chinese input system.
8.5 PERCEPTIONS OF HER OWN IT SKILLS

Flora suggested that, before the study, she was a relatively confident user in some areas but less proficient in others (Table 8.1). For example, she knew how to set up a computer by connecting the peripherals and using computers for graphics or music. Flora perceived herself as being able to install computer software, format hard disks and use scanners quite confidently. She also believed that she was proficient in the use of the word-processor and related techniques such as inserting tables and graphics into word-processed files, and the presentation software Microsoft PowerPoint®, all of which was to serve her teaching. She was also good at searching the Internet for teaching materials, and sending emails for communications. Flora’s score of perceptions of her own IT skills was 22 before the study, which placed her in the top five among other teachers of Philanthropy Primary School.

After the first year of the intervention in which teachers were required to explore the use of IT in their teaching and to submit their portfolio, Flora reported an enhancement in her perceptions of her abilities to use Microsoft Word® and Microsoft PowerPoint® from satisfactory to expert level. Although she recorded zero in using a database program and spreadsheet before the study, she actually had learnt Microsoft Excel® in 1995-96 (Fa: 21), and database systems in the 120-hour advanced course (Fa: 30). It is reasonable to believe that she also learnt about spreadsheets during the course. Flora maintained that she had some knowledge about using computers for graphics and music for first two surveys and that she was unable to write computer programs. The aggregate score of her perceptions of her IT skills increased from 22 to 31 at the end of the first year.

At the end of the second year in which teachers were left to work on their own with PAR activities and timetable reports, Flora reported a decrease of one level in two-thirds of her perceptions of the skills. The skills that were used in teaching, such as using word-processing software, presentation software, scanner, email, Internet and related techniques remained at a satisfactory level, while those techniques not so much related to teaching, such as setting up computers, installing software, formatting hard disks and using spreadsheets,
had decreased to a lower level of competency. Her aggregate score dropped to 20, but it was still above the mean of 17, as reported in Section 6.5.

Table 8.1
Flora’s perceptions of her own IT skills.

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use word-processor (Microsoft Word®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Insert tables in Word Processors</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Insert graphics in Word Processors</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use presentation software (Microsoft PowerPoint®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Design presentation software (PPT)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>3 (Expert)</td>
<td>2 (Good)</td>
<td>Use the Internet (Microsoft Internet Explorer®)</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Use email</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>Use a scanner</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>1 (Some)</td>
<td>Install computer software</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>2 (Good)</td>
<td>1 (Some)</td>
<td>Format a hard disk</td>
</tr>
<tr>
<td>1 (Some)</td>
<td>2 (Good)</td>
<td>1 (Some)</td>
<td>Set up computer hardware</td>
</tr>
<tr>
<td>1 (Some)</td>
<td>1 (Some)</td>
<td>0 (Cannot)</td>
<td>Use computers for graphics and music</td>
</tr>
<tr>
<td>0 (Cannot)</td>
<td>2 (Good)</td>
<td>1 (Some)</td>
<td>Use a spreadsheet program</td>
</tr>
<tr>
<td>0 (Cannot)</td>
<td>1 (Some)</td>
<td>0 (Cannot)</td>
<td>Use a database program</td>
</tr>
<tr>
<td>0 (Cannot)</td>
<td>0 (Cannot)</td>
<td>0 (Cannot)</td>
<td>Write computer programs</td>
</tr>
</tbody>
</table>

22  31  20

Key to the codes:
0: Does not have that skill
1: Has some knowledge about that skill
2: Is satisfactory in using that skill
3: Has expert knowledge in using that skill

8.5.1 FLORA’S EXPLANATIONS ON THE CHANGES IN PERCEPTIONS OF HER OWN IT SKILLS

Flora’s data showed that she had some enhancement in the perceptions of her skills in the first year, but dropped back to the initial states or lower at the end of the study, which conformed to the pattern of some teachers in her age group (Section 6.5, Table 6.1). Despite these formal survey responses, she denied that her skills had decreased. Her argument was:

If you use IT only for setting paper (word-processing) you will feel ok. You have learned and enhanced, but more requirements are added and the advancement in technology is so quick that you cannot catch up, so you will feel that you are not that capable. In the first year, we were required to set a paper only, so I had no problem. The next year, we had to do something more, for example, to write a web page. Though I had learned how to do it before, but since I had not used it for quite a while, I thus fell behind. The perceptions of high and low actually depended on the requirement on me. To explain why there was a drop, one should look at the tasks to be done in that year. For example, in 2000-01, the requirement
was only to use computers to set examination and test papers. I am sure that the majority of teachers would not have any problem. If there was any, it was the time. But now teachers are asked to develop web pages for the class, then it is something else. You have to learn something new. To learn to use the CAT platform, it is again something else. If the task is different, it may be above my capability, or I have not learned it yet, then I will lower my perceptions accordingly (Fc: 3:40-5:09).

Flora elaborated on what she meant by “new thing” by saying “as the requirements for the format of the test paper increase, say you want to add graphics (by) scanning in the graphs, which was done by cut and paste using scissors and glue before, you are adding more skills” (Fc: 5:50).

When they first started, they may start from using websites or Microsoft PowerPoint® only, but then they have enhanced. For example, when I first used IT, I use a website to teach, students were very happy. But after a while, I cannot keep on using websites and Microsoft PowerPoint®. When you first show them some graphics, then the story, what else? There are not many ways that you can do. If there is no new thing to learn, we have used what we know. Our perceptions of our abilities will thus slide down. In the beginning, we could put up a picture and said this was IT. But now, when we look back, we would say, Oh! That is IT. Our students will not be satisfied. Students have progressed. Teachers too have progressed. Relatively one would think one’s abilities become lower compared with the new level (Fc: 26:10).

When a teacher wants to advance to a higher level of knowledge and skills in using IT in teaching, the versatility and sophisticated applications of the packages require much more learning, knowledge and remembering of skills. If the teacher performs successfully, his/her confidence and self-efficacy will be enhanced and he/she will select a higher option in the survey. But if he/she encounters some problems, they may select a lower option. This explanation was given by those teachers who are good in IT skills like David, Kenfley, and Flora. For other teachers who had not really tried to use IT in teaching seriously, they might not experience such problems; they might not report such a decrease in their perceptions or self-efficacy.

Flora pointed out that the IT training sessions in the first year were for helping teachers to attain the prescribed level of IT competency, and after the sessions, they had handed in their portfolios. It was natural for teachers to reduce their level of reporting because they were not asked to hand in anything formally any more (Fc: 24:30).

Flora also mentioned in her first interview that she was not surprised that
some teachers admitted that they could use those skills before, but had forgotten how to do it later. She cited an example:

I know how to do film editing, but I may have forgotten and have little impression two weeks later. Two more weeks later, the number of people who can remember it may not be too many (Fa: 36).

Flora cited using Microsoft Word® as an example on how different versions of the software had affected her perceptions.

I found that after upgrading to Microsoft Windows or Microsoft Office, very often the file with contents shifted position, and sometimes could not even be retrieved. I believe that there are dead spots (bugs) somewhere in the programs. It causes trouble to teachers. For example, after I upgraded this year, the papers I made before the upgrade were not read properly. If another teacher who uses another version sends you a file, you may feel very painful. For example, when I was writing a book collaboratively with another teacher, I wrote one half and the teacher wrote the other half. When the teacher sent me a fully edited, properly formatted file, what I received was a file with all the graphics shifted. I had to edit it again from the very beginning. It was very painful. So I rather I did it all by myself. (Fc: 01:45)

In summary, Flora believed her own IT skills in reality did not drop although she selected lower scores. She attributed the apparent decrease in perceptions of her own IT skills to the following:

- More demanding requirements required by the school authority for using IT than in the previous year;
- More demanding expectations from students who had learnt more about IT;
- Infrequent use of some technologies led to the drop in familiarity, and thus decreased the confidence of using them;
- Technological advancement in educational systems such as the CAT (Computer Assisted Teaching) Platform which demanded time and effort to learn and master;
- Ever-changing Microsoft products which teachers have to unlearn and relearn.
8.5.2 FLORA’S VIEW ON THE DIFFERENCE IN CHANGES OF PERCEPTIONS BETWEEN FEMALE AND MALE TEACHERS

In Section 5.3.2, changes in perceived IT scores relating to gender were reported. Flora explained why the increase in female teachers’ perceptions of their own IT skills was higher than that of the male teachers as follows:

It was due to the fact that female and male teachers had different starting points in the learning of IT knowledge, skills and techniques. I feel that, in general, male teachers came across computers earlier than female teachers. So there starting points are higher than ours. If they want to enhance themselves, they have to make a big jump in order to see the enhancement. So it was more difficult for male teachers to be aware of greater difference while female teachers could feel an enhancement more easily when they were at a lower level of competency.

It is essentially the difference in expectation. Male teachers who were good at IT would find it more difficult to advance their IT techniques, which would require more knowledge and skills. Female teachers are different. They change from not knowing how to use computers to set a paper to now being able to do it, and thus feel very happy. Some female teachers might ask their husband or friends to help them before. Now they can do it themselves, of course there is enhancement. I had to ask friends to help when I tried to assemble a computer, or install a scanner. Now I can install a scanner, so I feel that I am very smart. Since our starting point was low before, we felt that we were good is a very natural phenomenon (Fc: 8:45-9:50).

Flora and David explained successfully why there were decreases in teachers’ perceptions of their own IT skills.

8.6 FLORA’S SELF-EFFICACY IN USING IT IN TEACHING

Flora’s self-efficacy values decreased steadily from the first survey before the study to the third survey at the end of the study, as can be seen from Table 8.2.

She maintained her belief that she was not afraid of computers strongly for the first year and slipped one level in the second year. The beliefs in her ability to use computers in teaching also remained at a favourable level for two surveys except for the item, “having sufficient knowledge and skills to use computers effectively in teaching in the classroom”. She was uncertain about items relating to using computers in teaching and learning. After the first year, Flora reported rises and falls in her responses. At the end of the second year, she reported drops of one to two levels related to her beliefs in using computers in teaching.
Table 8.2

<table>
<thead>
<tr>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey 1</td>
</tr>
<tr>
<td>SA</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>A</td>
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<td>N</td>
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<tr>
<td>N</td>
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<tr>
<td>N</td>
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<tr>
<td>N</td>
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<tr>
<td>N</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>39</td>
</tr>
</tbody>
</table>

Key to the codes:
SA: Strongly Agreed (5)
A: Agreed (4)
N: Neutral (3)
D: Disagreed (2)
SD: Strongly Disagreed (1)

8.6.1 FLORA’S VIEW ON THE DECREASE IN SELF-EFFICACY IN USING IT IN TEACHING

Before the study Flora claimed she had knowledge in using computers after taking the computer module at preservice, and was therefore not afraid of using computers. She was proud of her knowledge and ability to use computers and quoted as an example how she turned web pages into teaching materials (Fa: 25). Flora cited several examples of how she used IT to teach successfully.

I think IT has it advantages. For example, when I teach the stroke order of writing Chinese characters, I usually use the program which is available on the web. I just download it and don’t need to write the character stroke by stroke, and the kids can play with it. I save a lot of time. I am actually borrowing others’ time for my own use. You spent 10 hours to make it, I just use your 10 hours and save myself 10 hours. I feel that we are extending our working time and elongate our time and space. I think it is very good. But the problem is that it is not easy to find such a good program and it would be even more difficult to get a good web site. The
time I spend in search for the useful website may exceed a lot more than
the time I do it myself, but I don’t have such a capacity to make something
so good. So I rather spend some time searching for useful websites. I
schedule to spend an hour everyday to surf the web for good websites. I
search early the websites for the topics I teach. But very often, there is no
reward (Fc: 11:55 – 13:10).

She argued that teaching with a textbook on interesting topics such as
Bird-watching is planar, that is, using only one medium can only show static
pictures on the textbook. To teach the same topic using IT with graphics,
sounds and animations would become “stereoscopic” (Flora used this term to
mean multi-sensory) (Fa: 8). When she taught the topic Drug Abuse, she asked
her students to visit the relevant official websites.

I was amazed to learn that my students found another website on the
effects of Ketamine and other drugs. I was happy because my students
were actively engaged and showed understanding of the content so that I
was able to teach more effectively and cover two lessons in a double
period, which had never happened before by using chalk and talk only in
teaching. I also asked students to visit the websites of the Chinese White
Dolphin and found students excited by the web pages (Fa: 76).

Flora cited another incident of teaching with websites:

I find that there’re some excellent teaching materials developed by
teachers, such as festivals. There is one about Christmas. It asks students
to shoot a video to compare Christmas at different places. I feel that it’s
better than what I can explain. Students learn on how different people
spend their Christmas. Students would feel that Christmas should be cold,
snowing, with Santa Claus, but it might not be so in other countries, where
there’re people go swimming at Christmas. Students were very happy
when they saw new things. What we teach are limited, the chief point is to
let their minds open. When they discover that the world is so beautiful,
they’ll learn actively (Fa: 79).

Flora said that she “personally thinks the teaching websites and teaching
software are very important. If you can get very good teaching software, it
saves you a lot of talking” (Fc: 32:00). This statement may explain why Flora
agreed strongly that she was not afraid of using computers and was confident in
using computers.

Flora felt frustrated by the not-yet-ready infrastructure and unreliable
resource. She found that the number of computers available could not meet the
demands of teachers for use in teaching and students to use in learning (Fa: 12,
Fa: 14, Fa: 70, Fb: 54). The computers and the network were unstable (Fa: 10,
Fa: 109, Fb: 12). Students sometimes could not save their work in the folders
provided to them on the network (Fa: 9-10, Fa: 130), and even if they could

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save their work, other students might erase their work to get space for their own storage (Fa: 130-132). Flora’s students designed over 20 posters and saved them in the folder but these were completely erased by vandalising students, leaving only an empty template (Fa: 131-2). Many computer floppy drives could not write or read data, making it very hard for both the teachers and students even though they had very successful products (Fb: 4). The printers could not print (Fa: 133) and the computers in the classrooms did not work (Fa: 16). She cited an incident that occurred in a class developing an electronic book - the scripts were written and designed, but the computer could not save and students felt disappointed and sceptical, and asked “Is it okay, Miss? Will it not function again this time?” Students, too, were not confident in using the hardware at school (Fa: 10). As the tools were often not working properly (Fc: 16:15), she did not dare to use IT in teaching in a single period because if anything went wrong, she would not be able to do something remedial. So she used IT in teaching only in double periods (Fc: 16:35).

Flora stressed that the objectives of using IT in teaching should be for the students rather than for fulfilling the requirement of attaining certain percentage of time using IT as stipulated by the Education Department. Hence, the use of IT should aim at helping students understand and not for the sake of attaining the quota. She did not mind spending a lot of time and effort to use IT if it could teach students something that could not be learnt by using chalk and talk only, and would be very willing to take the initiative to use new ways of incorporating IT in teaching for her students (Fa: 7).

Flora expressed her concerns about the effects of using IT in teaching believing that there were many factors beyond her control when she used IT. The effects could not be anticipated. She cited four factors which might affect lessons when using IT in teaching, namely, the IT Team, the software, the timetable and the topic to be taught (Fa: 10). She ascribed the following meanings to these factors: Topic – was the topic suitable for incorporating IT? Timetable – was there a vacancy in the computer room, MMLC, or a well equipped classroom when required by the teachers? Software – is the software appropriate for use in my teaching? IT team – what support can I expect from members of the IT team? (Fa 11)
Flora is a competent and effective teacher who is frustrated by a range of technological and pedagogical issues. From Bandura’s Social Cognitive Theory (1977b), Flora’s unsuccessful performance experiences and vicarious experiences from working with her fellow teachers had affected her self-efficacy. She had strong beliefs that IT is helpful in teaching, and promoting students’ active learning and understanding, but because of the problems with the computers and the network, her objectives when using IT for her students could not be realised, and using IT in teaching seemed to be a waste of time to her. She considered that there were too many extraneous variables impacting on the effective use of IT by her and her students. Putting effort into learning about IT was not rewarded with successful outcomes. As the hardware and network were complicated, she was feeling overwhelmed and was not experiencing control or power over her own ability to cope. She said:

The resistance of IT from external environment is much greater than that from internal ability … Chalk and talk is different. Although it has two dimensions, I can control 90% of the environment. Good performance is depending on teachers. If IT is used, no matter how good is the performance, nothing works if the computer hangs … I feel external factor is beyond my control. I feel the advantages of chalk & talk from the beginning to midway to the end, there are lots of rooms that can be controlled by me (Fa: 10).

8.7 FLORA’S PATTERNS OF TEACHING PRACTICE WITH IT

Information about strategies incorporating IT in the teaching of various subjects extracted from the data recorded by Flora in weekly timetable reports are reported below.

8.7.1 PATTERNS OF TEACHING PRACTICE IN THE FIRST YEAR

8.7.1.1 CHINESE LANGUAGE

Flora taught 12 periods a week of senior Chinese language. She used a total of 51 strategies in eight periods with a variety of strategies from those used very often in teacher-centred to those in student-centred approaches. She went to the computer room or MMLC six times and asked students to do projects eight times, small and rotate groups five times each, and used IT as an information tool and collaborative environment four times each. She used IT to create a learning environment six times, and as a motivation tool and explanation five and four times respectively. Comparatively, she used less
presentation files, only twice by herself and twice by students.

Flora also taught ten periods per week of junior Chinese Language. However, she did not use as many IT strategies as in the senior class. She used only 14 strategies in six periods in four weeks. In a lesson in the fourth week, she used a presentation file as a motivation tool. She controlled the presentation herself and by her students. In a lesson in week 15, she took students to the computer room where she used IT to create a learning environment to motivate students to learn. Then she set tasks for the students in small groups. In week 23, she asked students to use IT to do projects in Chinese Language lesson and the tutorial lesson. In week 25, she also asked students to do project in the Chinese Language lesson and used IT to create a learning environment to search for information and as an explanation tool.

### Table 8.3

<table>
<thead>
<tr>
<th>Strategies incorporating IT in teaching</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Presentation controlled by teacher</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>2) Presentation controlled by students</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>3) IT as motivation tool</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>4) IT as explanation tool</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>6) Creating learning environment</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>7) Use IT as remedial teaching</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8) Use IT as rewards for accomplishing early</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9) Rotating groups of different tasks</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>10) Small groups of the same task</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>11) Teaching in the computer room</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>12) Project development</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>13) Project presentation by students</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>14) IT as information tool</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>15) Collaborative learning environment</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>16) Using OHP</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>17) Using VCD</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>18) Using web resources</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number of strategies</td>
<td>115</td>
<td>83</td>
</tr>
<tr>
<td>Mean no. of strategies per week in each year</td>
<td>4.60</td>
<td>2.59</td>
</tr>
<tr>
<td>Total number of periods using IT in teaching</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>Mean no. of periods using IT per week in each year</td>
<td>0.88</td>
<td>0.84</td>
</tr>
<tr>
<td>Mean no. of strategies per period</td>
<td>5.23</td>
<td>3.07</td>
</tr>
<tr>
<td>Total number of weeks using IT in teaching</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Mean no. of weeks using IT per week in each year</td>
<td>0.48</td>
<td>0.44</td>
</tr>
</tbody>
</table>
8.7.1.2 GENERAL STUDIES

Flora taught only 5 periods a week of General Studies, however, she used 50 strategies in 8 periods. She took students to the MMLC only twice. She reported using IT to create learning environments ten times and collaborative learning environments four times. She used IT as information, explanation and motivation tools seven times each. She also asked students to do projects using IT four times, but she used a presentation file only twice herself and her students four times. The analysis above has demonstrated Flora had tried a large number of strategies in her teaching.

8.7.2 PATTERNS OF TEACHING PRACTICE IN THE SECOND YEAR

Flora taught only two subjects to two classes in 2001-02. She taught Chinese Language and General Studies, a total of 25 periods per week, plus one period of Teach & Research regular meeting and a double period of weekly meeting or activities.

8.7.2.1 CHINESE LANGUAGE

Flora met her students ten times for the Chinese Language and tutorial lessons per week. She used 40 strategies in 12 periods of the Chinese language lessons and eight strategies in three periods of the tutorial lessons, a total of 48 strategies in 12 periods. She used presentations in only four lessons where she used IT to create a learning environment to motivate students to learn. She and her students controlled the presentation. She used IT to create a learning environment 11 times, including the presentations mentioned before, as an explanation tool eight times and information tool five times. She asked students to do projects five times and a presentation once. Again Flora used quite a variety of strategies incorporating IT in teaching and learning.

Flora also taught 11 periods of Chinese Language to another class. She used only 16 strategies in five periods. She did not use any presentations, but OHP, VCD, and IT as information tool once. She asked students to do projects and present them on five occasions.
8.7.2.2 GENERAL STUDIES

Flora taught four lessons of General Studies per week. She used 19 strategies in seven periods. She used presentation files for motivation and explanation, as well as IT as information tool. She did not ask students to do or present projects.

As shown in Table 8.3 and the detailed analysis of the strategies incorporating IT in teaching in various subjects, Flora used a variety of strategies incorporating IT in teaching. Besides using a presentation file and websites to create learning environments in a teacher-centred approach 18 times, Flora also used strategies in a more student-centred approach such as rotate groups, small groups, and project development. Hence she experienced more problems with the network system than other teachers who used mostly presentations.

Although there were decreased numbers of strategies incorporating IT in teaching in the second year, Flora still used quite a few presentation files and websites to create learning environments to motivate students and explain the contents in a teacher-centred approach. Flora mentioned that she asked students to connect and control the computer system for her (Fb: 107). She gave fewer projects to students, but she asked them to present their projects. She taught students to develop posters (Fa: 126). We can see that Flora had shown some changes in her teaching practice. But Flora complained that there were no resources and space given to teachers to do projects (Fc: 20:00), and students did not have training on how to do projects before (Fc: 19:30), so students’ work was often unsatisfactory (Fc: 20:10). Flora cited a few difficulties when asking students to do projects. The first difficulty was that students did not know how to use Chinese input methods through the keyboard. The second difficulty was that the installation of writing tablets often caused the computers to hang up. The third one was that some facilities of the computers like audio recording did not work (Fa: 10). The fourth one was that few students had a computer at home. She had to ask students to use the computers at school. Unfortunately, the computer room and MMLC were fully timetabled for various activities and hence it was virtually impossible to accommodate students doing their projects (Fa: 11, 12, 14, and 70). The fifth one was the
emphasis on bookwork. She also expressed her discontent that there were only one or two questions in the examination papers on the topics of the projects that had taken up a lot of students’ time to do, and the ratio of time and number of questions was out of proportion (Fa: 83). All these problems were reflected in her use of IT in teaching. As expressed by David that teaching in Hong Kong primary schools is highly structured and schedule-tight, teachers have to estimate carefully to ensure they can finish the scheduled tasks before they use IT in teaching (Section 9.12). They could not afford to lose a lesson because of equipment faults. Flora stressed that the computer system must be convenient to use. She believed that if the computer system is convenient, people will use it automatically (Fc: 13:40).

Flora’s interviews demonstrate that her uptake of IT in teaching was driven by a desire for her students to understand the content being taught and not to use IT for IT’s sake (Fa: 7). She asked students to surf the web to find websites relevant to the topics taught, so that students could learn by themselves. She asked students to do projects despite the limitations and difficulties. Over the second year there was little change in her practice except for her encouragement of some students to make presentations of their projects. Despite her positive attitudes towards using IT in teaching and citation of favourable examples, overall, however, there was a decrease in the number of strategies incorporating IT in teaching. Her average number of strategies using IT in teaching reduced from 4.26 to 2.44 per lesson in the second year, a drop of 43% of the value in the first year. The values conformed to those of the whole school, which changed from 3.85 to 2.01 (Table J.6, Appendix J). Flora believed it was a learning process. In the beginning teachers were forced to learn how to use IT in teaching. The novelty effect made teachers attempt to use IT and report their usage. After she learned more, she used only those she thought were good (Fc: 28:50) and she understood the merits and limitations of using IT. Since the teaching schedule was tight (FA: 18), she used IT because she needed it. She would not force herself to use IT if it was not needed in class (Fc: 13:50).
8.8 FLORA’S VIEWS ON SCHOOL-BASED TRAINING

As Flora had taken a 120-hour advanced course in IT at the Chinese University, she believed the content of the training sessions repeated what she had already learnt, so she attended only two sessions. However, she participated in the PAR activities and tried using IT in her teaching. She argued that if a teacher already knows more than the level of the training courses, he or she should be allowed not to attend these sessions, otherwise it would be a waste of time (Fc: 10:00, 11:15). She was one of the teachers who applied a large numbers of strategies incorporating IT. Her comments about the school-based, on-site and on going program with IT training sessions was that the training sessions were helpful to teachers with little knowledge, skills and techniques in using IT because they provided teachers with the basics (Fc: 07:00). She believed that school-based staff development is good for the school’s development, because the topics and levels are tailored for the majority of teachers. Teachers’ knowledge and skills in using IT had increased after the training sessions and applications in teaching (Fc: 11:00).

She believed the greatest advantage was to help teachers to see what they had not seen before. It was necessary for them to look beyond their own boundaries and see the new horizon.

I think the most important thing is to let them know what they don’t know. Some teachers are very resistant. They don’t believe the advantages of using computer. It’s because they haven’t experienced them before. They should broaden their horizons. When you are standing on top of a mountain, you can see very good scenery. However, when you are on the foot of it, you wouldn’t feel anything special. It is important to let them experience the difference. Same as my students, it is nothing at all just to say things, the key is to let them try and experience (Fa: 74).

8.9 FLORA’S VIEWS ON PAR

Flora was very positive about PAR. Commenting on David’s suggestion that the PAR groups should be limited to only the major subjects like Chinese Language, English Language, Mathematics and/or General Studies, Flora believed that there should be PAR groups for every subject for example Art (Fb: 66), and not just limited to the major subjects (Fb: 58). She also suggested the groups should be for teachers of the same year level so that they could share experiences arguing that teachers of the same subject but different year levels
could only talk about the tools while teachers of the same subject and year could talk about the content to be taught. She thought it was ideal and practical (Fb: 48).

Flora also suggested that the position of the IT Coordinator should be rotated because the responsibility should be shared. Everyone good at IT should have the opportunity to shoulder the responsibility (Fb: 91).

Flora commented on problems that had made PAR not as useful as intended. The first problem was the lack of time for the sessions. Theoretically, there was a period allocated for PAR every week, but in reality the senior teachers often used this class period to make announcements. After all the announcements were made, there were only a few minutes left (Fb: 85). Flora’s observation is in agreement with David’s comment that teachers had only just sat down and the meeting was concluded. The second problem was the demand of a teacher’s busy life, as revealed by the survey by the Hong Kong Professional Teachers’ Union (HKPTU, 2001, 2003). In her last interview, Flora complained about the numerous tasks to be discussed during the period, from IT, to teaching and research, and to individual subjects. Too much had been added (Fc: 38:15). The third problem was the composition of PAR groups. Even if there were some discussions, because teachers of different years were grouped together, they discussed only the hardware related issues and seldom on pedagogy (Db: 44, Fc: 39:00). The fourth problem was that teachers were not actively involved (Fc: 38:50). The school had a fixed period in the timetable for 分科教研 (Research on Teaching of individual subjects). Flora agreed that the research on teaching of individual subjects was one form of PAR (Fb: 89). She suggested that teachers should be grouped according to both subject and year as mentioned before. She agreed with the principal’s suggestion that every teacher should recommend at least one teaching program or a website which matches the scheduled contents of the subjects, with brief content description and rating on a scale of five stars, and placed on the teaching platform (Fb: 72-78). Flora believed that handing in the timetable exerted pressure on teachers to try to incorporate IT into teaching (Fc: 13:40). But she believed that:
It was a learning process. In the beginning, teachers were forced to use IT in teaching. After doing it, they learnt something … If I felt this strategy was good, I used it. I have integrated IT into my teaching, not like before that I felt ‘Oh! I haven’t used IT this week. Too bad. I need to use IT in one or two periods next week’. It would be different now. I feel that this website is very appropriate for this topic, then I use (Fc: 28:10-29:15).

8.10 CONCLUSION

Flora’s story confirmed that the professional development initiative helped teachers to use IT effectively in their teaching. She believed that the school-based, on-site and ongoing training with PAR activities was good for school development and for developing teacher’s knowledge and basic skills because the topics and levels are tailored for the majority of teachers. This program was especially good for novice teachers. It helped them to learn and to fulfil those exercises to attain the required level of competence and gave them an opportunity to experience the success of using IT, and to broaden their views. A closer look at the requirements of different levels of IT competence (Appendices K, L and M) would reveal that attaining the required competence could provide teachers with the confidence to use IT in their teaching. It confirmed Bandura’s (1977b) theory that successful performance experience enhances self-efficacy while set back and frustration diminishes self-efficacy and confidence.

Flora’s case provides insights into the indicator one: “what will be the change in teachers’ perception of their IT skills as a result of the intervention” for research question two: “what are the effects of a professional development initiative on teachers’ integration of IT in teaching”. Although Flora only attended two training sessions, she had participated in the PAR activities and submitted a Basic IT Competence Level portfolio. Her perceptions of her competence with Microsoft Word® and Microsoft PowerPoint® and some other areas increased after the intervention. Although Flora gave the perceptions of her own IT skills a lower value in the final survey, she argued in her interview that her skills had actually been enhanced. She attributed the fall in her perceptions of her own IT skills to the demanding requirements from the school authorities and students, infrequent use of some technology, rapid advancement in educational technology, and the ever-changing, hiding and regrouping of
features in Microsoft® products which are not backward compatible (Section 8.5.1). It was the more demanding requirements either for her or for the students that forced her to explore more advanced uses of IT. Because of this higher level and more complicated requirements she felt less capable. Flora believed that her skills have advanced to a higher level due to the intervention which included PAR and trial teaching with IT, but because of greater difficulties in using the more advanced techniques, her perceptions reflected her thinking according to the level of difficulties rather than the previous accomplishments. This explanation is consistent with the findings presented in David’s case (Section 7.7). At the same time, an issue that the survey items could measure their current perceptions and self-efficacy but not with reference to their previous values were also noted.

Evidence addressing indicator two: “what will be the change in their self-efficacy as a result of the intervention” for research question two. Flora expressed her eagerness to use websites and computer programs in teaching because she had performance experience in teaching the lessons on bird-watching, drug abuse, Chinese White Dolphin and Christmas using websites and asking students to surf the web for information. She believed that other teachers would gain vicarious experience (Bandura, 1977b) by observing how to do the same. Although she was hindered by the faulty hardware and the shortage of time to search for appropriate websites, she was confident in her ability to use the web in teaching. However, her frustration over the not-yet-ready infrastructure and unreliable resources had greatly diminished her self-efficacy. She reported a decreasing score each time to express her frustration in using IT at school.

As Flora was frustrated by the faulty hardware infrastructure, her self-efficacy dropped, and her number of strategies using IT decreased, but she believed her knowledge, skills and techniques had advanced after the difficulties. Thus her number of periods and weeks using IT increased. She became more selective to use only those strategies she found effective.

For indicator three: “what are the teachers’ common strategies in using IT in their teaching”, Flora used the computers in the classroom to enhance
teaching, not in the way mentioned by Cuban (2001) that computers in the classrooms were mainly used for record keeping purposes. She compared the need for using computers in the classroom and the computer room (Fc: 17:00-17:50) on analysis, pondering, reflection and all students looking at the same thing, or hands-on experience with computers.

For indicator four: “what are the changes in teachers’ practice”, Flora used more project development and project presentation than other teachers. She asked students to help connect the system before the class, and helped students to develop electronic books and posters. She asked them to collect information from the Web and other IT resources, and to develop and present their projects in class. Her uptake of a range of strategies and the advantages provided by the technology appears to have impacted on her teaching in ways that increased the level of student-centredness.

Flora also pointed out the problems and issues she came across, especially those due to the faults in hardware and network. These problems had affected Flora’s perceptions of her own IT skills as well as her self-efficacy and outcome expectancies. It is reasonable to assert that other teachers would be affected by these conditions in similar ways.

Another issue were the items about the perceptions of teachers’ own skills and their self-efficacy when using IT in teaching. These items are effective in measuring teachers’ current states, but since they were not designed for longitudinal research, they could not measure the subtle advancements after setback and frustrations.

In short, Flora’s story informs us that the professional development initiative is an effective professional development model for raising teachers’ uptake of IT in teaching from the basic level. There was an increase in the number of lessons using IT and changes of teaching practice to student-centred approaches were also observed in an education system of examination-oriented, subject-based and schedule-tight syllabi which could be regarded as a great achievement. But Flora’s unsuccessful performance and vicarious experiences due to problems in resources and logistics had weakened her perceptions of her own IT skills and self-efficacy, which are sensitive to many factors. Frustration
with inappropriate training, the inadequacies of working systems and the lack of time are serious inhibitors of change. The skills and techniques of using IT in teaching will be forgotten if they are not used for a while, which will cause teachers to experience a lack of confidence. The complicated and advanced nature of computer hardware and software also intimidates teachers, so there should also be some ongoing professional development which recognises these limitations and provides advanced training sessions on technical and pedagogical knowledge relevant to using IT in teaching so that teachers could get more help when they venture into using more complex, student centred strategies.
CHAPTER 9 SUSAN – THE “LATENT” ADOPTER

9.1 CHAPTER OVERVIEW

Susan is a female senior teacher in the school. She had low self-efficacy at the first survey and reported a medium number of strategies incorporating IT in teaching used in the first year of the study. She showed positive attitudes after developed a multimedia Microsoft PowerPoint® file, and started encouraging teachers to use IT. She made two interesting points in her interview which explained why there was a decrease in teachers’ use of IT in teaching, and why some teachers could not, or did not bother to go deeper into using IT in their teaching. Her behaviour was typical of a latent adopter. Susan was representative of those senior and experienced teachers in whose hand a Microsoft PowerPoint® presentation file became a very useful, vivid and effective teaching tool. In this chapter, as in the previous chapters discussing the experiences of Ken, David and Flora, Susan’s personal information and training in computers and information technology will be extracted from her surveys and interviews. Her frequency of computer use, perceptions of her IT skills and self-efficacy when using IT in teaching will be analysed from her survey data, with explanations given by her in the interviews. Susan’s patterns of teaching practice with IT in the two years will be extracted from the timetable report data. From her interviews, Susan’s views on school-based training and PAR will also be discussed. At the end of the chapter, research question two is examined in the light of Susan’s evidence.

9.2 PERSONAL INFORMATION

Susan is a female teacher in her early fifties. She graduated from the College of Education and was employed as a Certificate Mistress. She was promoted to the rank of Assistant Mistress, a senior teacher position. She has been teaching over 20 years. In the first year of the study in 2000-01, her teaching assignments were two classes of Chinese Language, three classes of Bible Studies, and one class of Putonghua. She taught 28 teaching periods plus three meeting periods. In the second year 2001-02, her teaching assignments were two classes of Chinese Language, and two classes of Bible Studies, for a total of 23 teaching periods plus three meeting periods a week. Although she is
a senior teacher, she is friendly towards colleagues and students, so she is respected by teachers and students.

**9.3 TRAINING IN COMPUTER AND INFORMATION TECHNOLOGY**

In her interview, Susan admitted that she and her colleagues had attended a computer training course organised by the Church. She continued her study of computers by taking two courses in the community training centres. So she had about two years’ experience in using computers before the study.

Susan attended the school-based training sessions and completed the hands-on tasks. She had attained the Intermediate IT (IIT) level of competence and developed a multimedia Microsoft PowerPoint® presentation file on Bauhinia and another one on parallelism which are included in the topics for the primary school Chinese language subject.

**9.4 FREQUENCY OF USE OF COMPUTERS**

Susan had a computer at home and used Microsoft Windows 98 and Office 97 software during the two years of the study. She used the computer mainly for developing Microsoft PowerPoint® presentations and compiling examination and test papers. She said she could not use computers frequently at school because there were only three computers and a lot of teachers were using them. She used computers at least once a week. Her frequency of computer use remained the same before and throughout the intervention. Susan used writing tablets to input Chinese into the computers and avoided using keyboard entry for Chinese input.

**9.5 PERCEPTION ABOUT HER OWN IT SKILLS**

As mentioned in the previous section, Susan had taken three courses before the intervention, but these courses did not improve her perception. Her score was only six as shown in Table 9.1. She reported in her survey items that she knew a little about word processing using Microsoft Word®, inserting tables and graphics into Microsoft Word®, using and designing Microsoft PowerPoint®, and using the scanners.

During the training sessions, Susan learnt how to design Microsoft
PowerPoint® slides and developed two teaching materials, one on bauhinia and the other on parallelism, which were used in her Chinese language lessons. She was quite proud of her Microsoft PowerPoint® files. She also learnt to compile her own portfolio using Microsoft Word® with tables, graphics and hyperlinks.

Table 9.1
Susan’s perceptions of her own IT skills.

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Some)</td>
<td>(Good)</td>
<td>(Good)</td>
<td>Insert tables in Word Processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use presentation software (Microsoft PowerPoint®)</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Good)</td>
<td>(Good)</td>
<td>Use word-processor (Microsoft Word®)</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Good)</td>
<td>(Good)</td>
<td>Design presentation software (PPT)</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Insert graphics in Word Processors</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Good)</td>
<td>Use a scanner</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Install computer software</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Format a hard disk</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Use a spreadsheet program</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Use the Internet (Microsoft Internet Explorer®)</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Use computers for graphics and music</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Set up computer hardware</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Use a database program</td>
</tr>
<tr>
<td>(Some)</td>
<td>(Some)</td>
<td>(Some)</td>
<td>Use email</td>
</tr>
<tr>
<td>(Can’t)</td>
<td>(Can’t)</td>
<td>(Can’t)</td>
<td>Write computer programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key to the codes:
0: Does not have that skill  2: Is quite good in using that skill
1: Has some knowledge about that skill  3: Has expert knowledge in using that skill

After the school-based training sessions and the PAR activities, and at the end of the first year, Susan reported an increase in her perceptions of her own IT skills. Although her perceptions of her ability to use Microsoft Word® and scanners remained low, her perceptions of her skills in using and designing Microsoft PowerPoint® files, inserting tables and graphics into Microsoft Word® had increased one level, from “some knowledge” to “quite good”. She also reported that she had gained some knowledge on how to install computer software, format a hard disk, use a spreadsheet program, use the Internet, and use computers for graphics and music. As shown in Table 9.1, her score had
risen from six to 15. Although the score was still relatively low, the change was 150% greater than the value before the intervention.

After the second year, Susan’s perceptions about using and designing Microsoft PowerPoint®, and inserting tables in Microsoft Word® remained quite good, and her perceptions of her ability to use Microsoft Word® had risen to quite good. Although there were drops in her perceptions of her ability to use the Internet and using computers for graphics and music, she believed she could set up a computer and use a database program. She mentioned that she used the Internet to search for information for her teaching materials, thus indicating that she had some knowledge about the Internet. But she did not use the Internet much in the second year, so she refrained from admitting that she knew how to use the Internet. The school was still using printed papers and briefings instead of emails, so she reported that she knew little about the Internet and email. As shown in Table 9.1, her perceptions were sustained in the second year.

9.5.1 SUSAN’S EXPLANATIONS ON THE CHANGES IN PERCEPTIONS OF HER OWN IT SKILLS

In her interview, Susan said that she found the teaching and contents of the school-based training sessions were just like other courses she attended before, but since the tutors were her colleagues, they knew her standards, her problems and what she did not understand. They could give her help whenever she needed it (Sa: 4:15 and Sa: 4:40). Since the training sessions focused on building their competence by doing the portfolio, there was an aim to learn IT, so she thought it was very helpful. She found that skills in using Microsoft Word® and the Internet were the most practical among other techniques. She found video recording and editing not very practical because teachers did not have time to do these tasks. The most useful techniques were associated with developing Microsoft PowerPoint® (Sa: 5:40). Though there were some small changes in individual items, Susan’s perceptions of her own IT skills were sustained in two years of PAR activities. She believed that her self-recognition became higher after doing the Microsoft PowerPoint® file (Sa: 9:10). Her belief
agreed with Bandura’s (1977b) theory that successful performance accomplishment enhances self-efficacy. She found that there was no time in the second year for her to work more on using IT because there were so many important education reform activities like “Life-wide Learning” and School-based Curriculum Tailoring (Sa: 14:40).

Two interesting points were raised by Susan. The first point was that teachers were just like students. After finishing the portfolio, teachers became relaxed, and did not pay as much attention to it as before. When teachers were required to hand in their timetable each week, there was invisible pressure acting on them. If they did not use IT for one, two or three weeks, they would feel the pressure and would try to arrange a time to use IT. This is the effect of top-down policies requiring teachers to perform certain tasks without changing their mindset. Under the policy stipulated by EMB, teachers have to use IT in 25% of their teaching. Teachers are under pressure to use IT in their teaching. Some of them use IT just for the sake of fulfilling the quota. When they were not required to record their usage, they were more relaxed (Sa: 14:30).

The second interesting point was that the help from colleagues might not always encourage teachers, especially senior teachers, to spend time to really learn IT themselves. When they asked for help, the IT Team members would come to assist them instantly. Teachers became dependent on the IT Team members, and without them, teachers could not do much (Sa: 7:30).

Susan believed that the increasing number of teachers using IT was due to the training sessions which enabled them to acquire appropriate knowledge and skills, and the supporting environment where IT members helped them in their lessons in the computer room and MMLC (Sa: 11:10).

9.6 SUSAN’S SELF-EFFICACY IN USING IT IN TEACHING

Susan’s self-efficacy was low before the intervention. The only one positive response was that she had confidence in using computers at work. She disagreed strongly that she already had sufficient computer knowledge and skills to use computers in teaching. She did not know how to follow the steps to use computers effectively as a tool to aid teaching, how to get students to use computers to study, and how to manage the learning environment effectively
for the use of computers in the classroom. She found it difficult to advise students about how to use computers in their study, and could not always answer students’ questions relating to using computers in study. She was afraid of computers. Her total score in self-efficacy was 23 before the study (Table 9.2).

Table 9.2
Susan’s self-efficacy in using IT in teaching.

<table>
<thead>
<tr>
<th>Survey 1</th>
<th>Survey 2</th>
<th>Survey 3</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>I have confidence in using computers at work</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I know how to follow the steps to use computer effectively as tool to aid teaching</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>A</td>
<td>I am satisfied with my results of using IT in teaching</td>
</tr>
<tr>
<td>D</td>
<td>A</td>
<td>N</td>
<td>I know how to get students use computers to study</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>A</td>
<td>I’m not afraid of using computers</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>A</td>
<td>I am often able to use computers effectively as an assisting teaching tool in the classroom</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>N</td>
<td>I know how to manage effectively the learning environment for the use of computers in the classroom</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>N</td>
<td>I don’t feel difficult to advise students how to use computers in their study</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>N</td>
<td>I can always answer students’ questions relating to using computers in study</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>N</td>
<td>I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom</td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>I have already had sufficient computer knowledge and skills to use computers in teaching</td>
</tr>
</tbody>
</table>

| 23 | 30 | 38 | Total |

Key to the codes:
SA: Strongly Agreed (5)
A: Agreed (4)
D: Disagreed (2)
N: Neutral (3)
SD: Strongly Disagreed (1)

After the training sessions and PAR, besides being confident about using computers at work, Susan believed she knew how to follow the steps to use computers effectively as a tool to aid teaching and how to get students to use computers to study. She was satisfied with the results of her use of IT in teaching. Susan responded less negatively on the item that she had already had sufficient computer knowledge and skills to use computers in teaching. She was still afraid of computers and remained negative with the other items. Table 9.2 shows that her total score had increased from 23 to 30. Her self-efficacy had improved.
At the end of the second year, Susan maintained her confidence in using computers at work, her beliefs that she knew how to follow the steps to use computers effectively as tool to aid teaching, and her satisfaction with her results of using IT in teaching. She believed she was often able to use computers effectively as a teaching tool in the classroom. She was not afraid of computers any more. The responses to all other items had also changed from “Disagree” to “Neutral”. While the self-efficacy of some teachers had decreased, Susan’s total score had increased further from 30 to 38. It was quite an improvement in her self-efficacy, as shown in Table 9.2.

9.7 SUSAN’S PATTERNS OF TEACHING PRACTICE WITH IT

Information about strategies incorporating IT in teaching of various subjects extracted from the data recorded by Susan in weekly timetable reports are summarised as follows:

9.7.1 PATTERNS OF TEACHING PRACTICE IN THE FIRST YEAR

Susan taught 19 periods of Chinese Language to two classes, one period of Putonghua (Mandarin Chinese), and one period of Biblical Studies to each one of the eight classes in a week. She has a workload of 28 teaching periods plus one period for research and weekly meeting and a double period for activities. As a senior teacher this workload is not light, although some people may think that Biblical Studies lessons are lighter in preparation than main subjects like Chinese language, English language, or mathematics.

9.7.1.1 CHINESE LANGUAGE

Susan used IT in three lessons for each class of Chinese Language. In week four, she took the two classes to the computer room respectively. She used Microsoft PowerPoint® presentation mainly to create a learning environment for motivation and explanation. She also organised small groups working on the same job. For presentations, she controlled it as she taught, and asked students to control it during the question time and revision as reinforcement. Her applications of IT were teacher-centred.
9.7.1.2 BIBLICAL STUDIES (BS)

In her BS classes, Susan used the VCDs provided by the publishers on the life and teaching of Jesus Christ to create a learning environment to motivate students to listen and to explain some of the facts. Her applications of IT in this subject were also teacher-centred.

9.7.2 PATTERNS OF TEACHING PRACTICE IN THE SECOND YEAR

Susan taught ten periods each of two classes of Chinese Language, and one period each of three classes of Biblical Studies. She had a lighter workload of 23 periods plus one period of “Teaching Research” and a double period for meeting in the second year.

Table 9.3
Record of Susan’s use of strategies incorporating IT in teaching.

<table>
<thead>
<tr>
<th></th>
<th>2000-01</th>
<th>2001-02</th>
<th>Strategies incorporating IT in teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>2</td>
<td>2</td>
<td>Presentation controlled by teacher</td>
</tr>
<tr>
<td>2)</td>
<td>3</td>
<td>8</td>
<td>Presentation controlled by students</td>
</tr>
<tr>
<td>3)</td>
<td>10</td>
<td>12</td>
<td>IT as motivation tool</td>
</tr>
<tr>
<td>4)</td>
<td>0</td>
<td>9</td>
<td>IT as explanation tool</td>
</tr>
<tr>
<td>5)</td>
<td>19</td>
<td>22</td>
<td>ETV</td>
</tr>
<tr>
<td>6)</td>
<td>0</td>
<td>0</td>
<td>Creating learning environment</td>
</tr>
<tr>
<td>7)</td>
<td>0</td>
<td>0</td>
<td>Use IT as remedial teaching</td>
</tr>
<tr>
<td>8)</td>
<td>0</td>
<td>0</td>
<td>Use IT as rewards for accomplishing early</td>
</tr>
<tr>
<td>9)</td>
<td>0</td>
<td>0</td>
<td>Rotating groups of different tasks</td>
</tr>
<tr>
<td>10)</td>
<td>2</td>
<td>1</td>
<td>Small groups of the same task</td>
</tr>
<tr>
<td>11)</td>
<td>0</td>
<td>0</td>
<td>Teaching in the computer room</td>
</tr>
<tr>
<td>12)</td>
<td>0</td>
<td>0</td>
<td>Project development</td>
</tr>
<tr>
<td>13)</td>
<td>0</td>
<td>2</td>
<td>Project presentation by students</td>
</tr>
<tr>
<td>14)</td>
<td>0</td>
<td>0</td>
<td>IT as information tool</td>
</tr>
<tr>
<td>15)</td>
<td>0</td>
<td>0</td>
<td>Collaborative learning environment</td>
</tr>
<tr>
<td>16)</td>
<td>0</td>
<td>1</td>
<td>Using OHP</td>
</tr>
<tr>
<td>17)</td>
<td>0</td>
<td>0</td>
<td>Using VCD</td>
</tr>
<tr>
<td>18)</td>
<td>0</td>
<td>0</td>
<td>Using web resources</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>70</td>
<td>Total number of strategies</td>
</tr>
<tr>
<td></td>
<td>2.15</td>
<td>2.06</td>
<td>Mean no. of strategies per week in each year</td>
</tr>
<tr>
<td></td>
<td>2.52</td>
<td>2.19</td>
<td>Total number of periods using IT in teaching</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>32</td>
<td>Mean no. of periods using IT per week in each year</td>
</tr>
<tr>
<td></td>
<td>0.85</td>
<td>0.94</td>
<td>Mean no. of strategies per period</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>19</td>
<td>Total number of weeks using IT in teaching</td>
</tr>
<tr>
<td></td>
<td>0.44</td>
<td>0.56</td>
<td>Mean no. of weeks using IT per week in each year</td>
</tr>
</tbody>
</table>
9.7.2.1 CHINESE LANGUAGE

Susan compiled a Microsoft PowerPoint® file which was for Chinese lesson on Bauhinia. She was proud of it, but she did not use strategies incorporating a Microsoft PowerPoint® presentation often, because she wanted to develop her own Microsoft PowerPoint® slides, yet she did not have the time to do it (Sa: 19:10). Susan used 29 strategies in 15 periods of one class and 30 strategies in 14 periods of another class of Chinese Language class respectively. She used mainly presentation and ETV to create a learning environment and used IT as motivation and explanation tools. From her classroom observations, she guided students along by showing pictures and reading texts. She showed the video on flowers in Microsoft PowerPoint® slides to students first as motivation, and then she asked students to read the text by themselves. While the students were reading the text silently, she pointed out the main points for students to note. She asked students questions about these points after students finished reading. By asking questions, she slowly unfolded the content of the lesson. Susan then used the Microsoft PowerPoint® as a menu which pointed to different parts of the flower, which in turn pointed to different adjectives and phrases. By showing the pictures on the screen, she asked students to compare them with those in the textbook. Through showing pictures and asking questions, she engaged students in learning actively together. After answering the questions, students were asked to read the text out loudly together again. There were communications between teacher and students; students were actively involved; and the content was repeated several times to ensure students had mastered. This pattern of teaching is common in primary classrooms. It conforms to the way described by Biggs (1996) and Salili (2001) in Sections 2.7.1.7, 2.7.1.8 and 2.7.2.

She often asked her students to look for information on the Internet by saying “I came across a website before, which has some good materials, please search it for me”. Three or four days later, students came and said, “Ms Young, I think it was this one. Please see whether it is the one you are after” (Sa: 24:00).
9.7.2.2 BIBLICAL STUDIES

Susan used seven strategies in two periods in one class and four strategies in one period in another class of BS. Similar to what she did in the first year, she used mainly the VCD from the publishers to create learning environment to motivate students and explain content of the lessons.

Susan used more strategies, periods and weeks incorporating IT in teaching in the second year (Table 9.3). However, when taking into account that there were 27 weeks in the first year and 34 weeks in the second year, her average strategy per week was lower in the second year compared to the first year. The average number of periods in the second year was slightly higher than that of the first year, meaning that Susan slightly increased her use of IT in her teaching. The number of weeks incorporating IT in teaching was higher in the second year too, implying her use of IT in teaching was spread out over more weeks, which may mean that she had become more familiar with using IT in her teaching.

9.8 SUSAN'S VIEW ON USING IT IN TEACHING

Susan gave explanations why she chose to use IT in teaching and listed some obstacles in using IT in teaching in her interview.

9.8.1 REASONS FOR USING IT IN TEACHING

Susan chose to use IT in teaching because:

- IT can motivate students

  I wanted to use IT because it can arouse a very strong interest in the students. She pointed out when using IT in teaching the life of Jesus in a class, after turning off the computer for discussion, the students were highly motivated. She thought that no matter how vividly she talked, students’ visual perceptions were more important (Sa: 11:50).

- IT helps make teaching easier

  Using IT helps make teaching easier by citing an example in using a program on writing Chinese characters to support her statement. She argued that the demonstration was done by experts, the layout was well planned, the content was carefully selected and very clearly taught, and the characters were beautifully written (Sa: 21:10).

- IT helps classroom management
IT helped classroom management because she could move around and watch the students to see whether they were paying attention and trying to follow the writing. She argued that if there was no such item as a program, she had to write and could not pay attention to the students at the same time. She claimed that an advantage of using IT is that teachers can have the time to watch how students behave in the class (Sa: 21:30).

- IT enhances teaching content

IT can enhance teaching content because if there were concepts missing in the CD-ROM, she could add remarks to supplement it. If she taught herself, she might not be aware of what she had missed. If the CD-ROM and the teaching materials from the Web matched her syllabus, IT would surely help her teaching (Sa: 20:00).

Susan believed that using IT in teaching is like cooperative teaching. The program or presentation acts as a teacher, and the teacher acts as a facilitator. It is equivalent to having two teachers teaching the same class, one is a knowledge expert and the other is a pedagogy expert. Students can be better monitored and help can be extended instantly to students who need it.

9.8.2 OBSTACLES TO USE OF IT IN TEACHING

Susan found two important obstacles to using IT in teaching.

- Her own IT knowledge, skills and techniques

Contrary to the young and IT knowledgeable teachers such as David (Sections 7.5 and 7.6), Susan believed her IT skills and techniques were not up to the required levels. She cited an instance in which, due to a syntax error of using a comma instead of a full stop, she was caught in a debugging loop and spent long hours trying to figure out the source of trouble with no immediate solution. She was enlightened by her colleagues the next day when she asked them. Susan believed that she was prevented from using IT by these little things which she could overcome if her IT knowledge, skills and techniques were better. She was keen to learn, but did not have the time to do so (Sa: 22:35).

- Her time to prepare for teaching incorporating IT

In agreement with the HKPTU Surveys (Sections 2.7.4.2 and 2.7.5.2) and comments by David (Section 7.8.3.1), Susan claimed that she did not have time to prepare and try using IT in teaching. As a senior teacher, she has a lot of administrative work to do as well as teaching (Sa: 23:15).

Susan overcame the obstacle by asking students to help in setting up the
hardware and software, and finding the websites for her when she wanted students to see something on the Internet (Sa: 23:40).

9.9 SUSAN’S VIEWS ON SCHOOL-BASED TRAINING

Susan had taken three computer courses, one organised by the Church that runs the school, and the other two in community centres. She was able to compare school-based training and other forms of training. She found that when the objective was to help teachers to learn the required techniques and skills to complete their portfolio with hands-on practice, the training sessions were very helpful (Sa: 5:10). When the tutors were fellow teachers, they were from the same culture (homophilous, Rogers, 1995) as the participants and could take on their roles (empathise with them). The tutors knew the teachers’ standards, their problems, and the places where they did not understand (Sa: 4:15). When the tutors were colleagues, participants could get help any time when they came across problems (Sa: 15:45). They could get support with preparation to teaching in the MMLC (Sa: 4:40). Susan believed school-based training could help build participants’ confidence and some basic techniques (Sa: 15:20).

9.10 SUSAN’S VIEWS ON PAR

Susan pointed out that teachers have to teach a few subjects at different year levels. Although there was one period set aside for PAR, they might not be able to sit down and share ideas and experiences because there were a few different groups they had to go to. As the schedule was tight, if teachers could not meet before the topic, time would soon pass, and the sharing became less useful (Sa: 24:20). In agreement with David (Section 7.9) and Flora (Section 8.9), and unlike Ken (Section 6.9), Susan thought the timetable was an invisible pressure. When a teacher handed in blank timetables over a period of one, two or three weeks, the pressure about using IT mounted. The teacher might try to use IT for IT’s sake to fill the quota. However, Susan believed this would expose teachers to more opportunities to get some performance experience. When teachers were not required to hand in timetables, they would become relaxed and the use of IT would drop (Sa: 26:15).
9.11 CONCLUSION

From what has been presented above, we can see that school-based, on-site and ongoing training by colleagues is useful in building the skills and techniques of teachers. After the training sessions, Susan was able to complete her portfolio and developed the Microsoft PowerPoint® teaching file she was so proud of, and her confidence was enhanced. To answer research question two: “what are the effects of a professional development initiative on teachers’ integration of IT in teaching”, indicator one: “what will be the change in teachers’ perception of their IT skills as a result of the intervention” and indicator two: “what will be the change in their self-efficacy as a result of the intervention” were informed that, after the intervention, Susan’s perception of her own IT skills and her self-efficacy in using IT in teaching increased. Thus the professional development initiative enhanced teachers’ perceptions of their own IT skills and their self-efficacy in using IT in teaching. After her success with her Microsoft PowerPoint® files, Susan became very positive. She was eager to share her Microsoft PowerPoint® files with others, and used the VCDs from the publishers. Successful performance enhanced Susan’s self-efficacy which, in turn, increased her use of IT in teaching (Bandura, 1977b). From the detailed analysis of her timetable report it is found that Susan’s teaching was mainly expository in the traditional Chinese way of teaching as described by Biggs (1996) in Section 2.7.2. She used the Education TV program in VCD format to build a learning environment where her students could be motivated to watch the multi-sensory presentation, read the texts under her prompts, and provide their own examples in front of the class. Students learnt actively and effectively in this environment.

There was only PAR in the second year and there were also new education innovations such as “Life-wide Learning” and Curriculum Tailoring which took a lot of teachers’ time. Drops in the self-efficacy and perceptions of many teachers were recorded from the last survey. But Susan’s use of IT was sustained. For example, the number of periods where she incorporated IT over the reporting periods remained the same in the two years. She used the VCD on the life of Jesus Christ in Bible Studies and others like the one about Guilin in Chinese lessons for enhancing students’ learning. For indicator four: “what are
the changes in teachers’ practice”, there was no sign of a paradigm shift, but
from her classroom observations, she had integrated IT into her teaching.

Susan pointed out an issue of school-based training conducted by peers. It
was the dependence on the tutors by the participants. This was especially true
for senior teachers. Tutors would sometimes intentionally or unintentionally
help them more than required which may not have enhanced their confidence or
perceptions. Thus Susan thought that she could not do much if the help was not
there (Sa: 7:30).

Susan’s case is representative of some of the experienced teachers who
found that IT is useful in teaching. They were eager to use IT but limited by
their knowledge, skills and techniques in using IT, and their time to prepare and
try teaching incorporating IT. They could overcome the obstacles through the
pedagogical means of involving students in helping them, and thereby enabling
students to participate actively in learning. This may explain why the frequency
of computer use by the experienced teachers (Section 5.2.5) and the perceptions
of their own IT skills (Section 5.3.5) were sustained, and self-efficacy could
improve in the second year (Section 5.4.3). Thus Susan’s case is illustrative of
experienced teachers who are latent adopters.
CHAPTER 10 OTHER TEACHERS’ VIEWS

10.1 CHAPTER OVERVIEW

As well as the four representative teachers who reported in the previous chapters, there were other teachers whose experiences elaborate on the research questions. These supplementary issues which were extracted from the portfolios of Sara, Irene, May, Veronica and Lida are discussed in this chapter. They illustrate a range of outcomes including a sense of pride in the teachers’ achievement, impact on students, value of IT in teaching, the importance of collegial support, but also highlight the extra workload and time commitment which are required to implement IT in teaching and learning.

10.2 SARA

Sara is an example of a teacher who struggled with IT but acknowledged her success and demonstrated substantial increase in self-efficacy and perceptions of her IT skills after the school-based training sessions. For example, her self-efficacy score increased from 30 to 44 on a scale from 11 to 55 and her perception of her IT skills had increased from 6 to 19 on a scale from 0 to 45. She was an experienced teacher over 50 years of age who expressed proudly her achievement in the portfolio:

The Portfolio was done by me myself personally after spending a lot of time, energy and effort in the training sessions. I knew very little about computers before the intervention. Starting from learning the computer operations to the compilation of the teaching portfolio, I committed considerable time and effort, and accumulated a lot of bitter and poignant memories, failures and frustrations. From being afraid of computers to become interested in computers, those kinds of bitter and joyous feelings can only be understood by oneself.

The uptake of any innovation requires commitment and time but as exemplified by this teacher, persistence can lead to success and a sense of satisfaction.

10.3 IRENE

Irene, a senior teacher over 50 years of age, reflecting in her portfolio, talked about her lesson:
Using IT was lively and attractive. My students were attentive and learnt with great efficiency in this lesson ... When they played the guessing game, they were excited. As it was quite easy, they could easily choose the right answer. The sound effects of the Microsoft PowerPoint® slideshow enchanted them very much ... By using IT in teaching, it would be much easier to arouse the interest of students in learning the topic than the traditional teaching method.

But Irene also complained that she “spent a long time to search suitable teaching materials from the Internet and to develop Microsoft PowerPoint® slide show”.

10.4 MAY

May was in the group of teachers from 31 to 40 years of age with 11 to 20 years of teaching experience. She taught mainly music, with an English class and a mathematics class. She selected an introduction to orchestra as her trial teaching using IT. She integrated the pictures of the common stringed instruments, characteristics and sounds, and a video clip of the performance of an orchestra, and then linked this to some interactive questions to promote students’ understanding of stringed instruments. She was very pleased by the result of using the presentation in her teaching.

When the (Microsoft PowerPoint®) presentation was first played, students’ emotions were excited by coming across teaching music using IT for the first time. But they were soon attracted by the slides with sounds, colours and pictures, and participated actively in the class. As the presentation had been rehearsed several times, I could master precisely the teaching progress with ease. I was most satisfied with the interactive exercise section. Students could answer nearly all the questions correctly. That is to say that this time the result was ideal. Even though a lot of time and effort were spent, I still felt very glad.

10.5 VERONICA

Veronica was also a senior teacher in her fifties who had taught for over 30 years. She exhibited a highly reflected analysis of her experiences by considering the significance of IT to different stakeholders including students, teachers, school and society at large. Her reflection illustrated a reasoned approach to why she attempted to employ IT in teaching. She believed that using computers as a teaching medium has characteristics of variety and multi-functionality that assists students’ learning. She argued:

Ordinary traditional media such as slide projectors, video recorders are incomparable in the impact on student learning. The graphic animations
on the screen, the change in colours and the sound effects catch students’
different senses, greatly enhance learners’ interest, and are the reasons
why IT can hold the attention of learners.

As an experienced teacher, Veronica had got used to the
examination-oriented, schedule-tight teaching approach. On the benefits for
teaching using IT, she believed that the lack of time is the most difficult
problem for teachers to solve. She believed searching information on the web
saves time and is convenient. She also believed, like David (in Section 7.7.1.4),
that using Microsoft PowerPoint® presentations in the classroom can teach
quicker than using on the chalk board.

These presentations can be modified any time the teacher thinks fit, and
can be used repeatedly. In small group teaching where teachers have to
demonstrate repeatedly to the members of different groups, it is a waste of
time. If the demonstrations can be filmed and displayed for the whole
class to watch, it would improve the classroom discipline indirectly too.

Veronica was thinking of using IT as a diagnostic and learning
management tool. She argued that setting examination papers is one of the
heavy workload tasks.

Using computer file management and editing capability, teachers can
modify more quickly and set up an effective question bank for future
repeated uses. A computer’s data manipulation capability and provision of
charts and graphics help teachers to achieve faster and deeper comparison
and analysis of students’ learning so that they can make adjustments in
teaching to enhance the effect of teaching and learning.

On the characteristics of effective software, Veronica believed that
effective learning packages can, besides enhancing students’ interest, provide
students’ with instant and important feedback.

When students experience frustration, the software should provide
encouraging phases and help increase the confidence of the learners.
Learners can set the level of difficulty to suit their ability to avoid
constant failure which may result in giving up learning. Learning software
is just like a good teacher who accompanies the learners, to offer them
instant help. Resources on the web are rich and up-to-date, which provide
students with excellent conditions for nourishing their interest in
investigation.

Teachers like Veronica had expressed opinions that illustrate that the
school-based training sessions had impacted on their sense of purpose for the
introduction of IT in teaching. While she expressed strong opinions about the
importance of IT, her levels of self-efficacy remained low, implying her need
for further support and successful experiences while using the technology
herself.

10.6 LIDA

Lida was appreciative of the teaching and help given by her fellow teachers. She said in her portfolio:

Fortunately the younger teachers in our school are so kind and helpful. They are always ready and willing to help the older teachers like me. Their kindness and helpfulness encouraged me to use IT in teaching. So I would like to take this opportunity to say “Thank You!” to all the IT Young Men in our school.

Lida also pointed out the restrictions in using IT in teaching. She said:

It took quite a long time for me to prepare the power point presentation. As the workload is heavy, so I think it is impossible to use IT teaching frequently. Besides, not all the topics are suitable for teaching with the use of IT. Thus we have to select appropriate topics and tailor the content for teaching. In addition, I am facing some technical problems, the problems of hardware, software and auxiliary equipment.

From the peer-tutoring training sessions, Lida learned not only the knowledge and techniques of using IT in teaching, but also the problems and issues, and the solutions by contemplating the suitability of using IT to teach certain topics.

10.7 SUMMARY

From the survey, timetable reports, interviews, classroom observations, and teachers’ portfolios, the following points can be summarised.

10.7.1 THE ENVIRONMENT WHERE TEACHERS ARE TEACHING

The Hong Kong education system is different from that in western culture, so it may be difficult for people to understand why it is hard to have a paradigm shift in Hong Kong.

The teachers were educated in the examination-oriented, performance-oriented environment. When they were students, they strived to gain good marks so that they could get into higher education. They all know how important it is for students’ futures to get good marks. “Just about all of the students would have passed through the Hong Kong school system and would therefore have a long history of exposure to didactic forms of teaching. They would have been used to a system geared to learning material for frequent
external examinations which have a major impact upon their future in a system which is still highly selective” (Kember, 2001, pp. 262-263). When they become teachers, they tend to use the teaching methods they are used to. From the timetable reports over the two years, teachers’ common uses of IT were mainly in teacher-centred approaches, as can be seen in the next section.

10.7.2 TEACHERS’ COMMON USES OF IT

From the quantitative results reported in Sections 5.6.1 and 6.6.5, and case studies in Sections 6.9, 7.7, 8.& and 9.7, it was found that the three most frequently used strategies incorporating IT in teaching were motivation, explanation and creating a learning environment.

While teachers in Western culture often place emphasis on motivating students’ independent study, self-confidence, self-esteem, patience and persistence (Biggs, 1996; Davis, 1993; Watkins, 1996), teachers at Philanthropy Primary School who were under tight teaching schedules emphasised the arousal of students’ attention in listening through the lively, attractive and novel multimedia effects of Microsoft PowerPoint® slides so that students could learn with great efficiency (Sections 10.2, 10.4, 10.5) and teachers could “introduce a lot of content to the students in a very short time” (Section 6.11.2). They felt happy because their students were actively engaged and showed understanding of the content so that they were able to teach more effectively and could cover two lessons in a double period, which had not happened when using chalk and talk only in teaching (Section 8.6.1).

Since most teachers used teacher-centred approaches, IT became a tool which was actively used at a suitable time with a suitable software package, or video clips, or graphics, animation and sound, to perform demonstrations to clarify the concepts; demonstrate phenomena; explain a theory; or to motivate students’ interest (Table 2.5, Section 2.5.4).

The learning environment in Hong Kong is also different from that in Western culture. From the “Repertoire of strategies of using IT in Teaching” (Table 3.4, page 89), creating a learning environment such that teachers use computers to display graphics, video, animation or film for classroom discussion, essay or report writing (Table 3.4, Section 3.4.3.3.2) in
teacher-centred approaches is foremost. The aim of using IT is to facilitate teachers’ “efficient” teaching, as discussed in the previous section, so that they can teach faster and cover more in the set time. Although the education authority has been promoting a paradigm shift and education reform like “Learning to Learn” and “Life-Wide Learning” (Curriculum Development Council, 2001, 2003; Education Department, 2002; Education Commission, 2002), at the same time, they publish the value-added schools which emphasise public examination results (Education and Manpower Bureau, (n.d.); Singtao Education, 2003a). Schools stress examination results. When only a few questions in the examination are set on the topics of the projects, teachers worry about the marks their students could achieve (Section 8.7.2.2). People in countries where primary schools have no public external and internal examinations may not understand the pressure on the teachers in Hong Kong, and why it is so difficult to see any paradigm shift, because even the student-centred learning is focussed so that students can achieve better examination results through using this approach.

10.7.3 TEACHERS’ VIEWS ON THE INTERVENTION

Flora pointed out (Section 8.8) that teachers at Philanthropy Primary School were very resistant to using IT in teaching and learning before the intervention. They did not believe the benefits of using IT because they had not used IT in this way previously. She thought it was necessary for them to look beyond their own boundaries and see a new horizon (Fa: 74). She believed that school-based staff development was good for the school’s development, because the topics and levels were tailored for the majority of teachers (Fc: 11:00). Being a member of the IT Team and one of the tutors, David believed the intervention was very helpful for teachers because they liked to be taught by their colleagues (Section 7.8). Ken also attributed the success to the instant help from colleagues (Section 6.10). They agreed with Rogers’ (1995) theory that the tutors were better in IT knowledge (Heterophily) but similar in other attributes as fellow teachers (Homophily), so they were able to put themselves into the situation of the participants (empathy) and understand their problems and concerns, thus they could help the participants better than tutors in other training centres.
Teachers were appreciative of the help from their younger colleagues. Lida attributed her accomplishments to the kind and generous help from them (Section 10.3) because they were always ready to help. Sara did not specifically acknowledge her learning from the tutors (Section 10.1). Flora pointed out that teachers’ knowledge and skills in using IT had increased after the training sessions and applications in teaching (Section 8.8). Sara started from knowing very little about computers to finishing her portfolio with pride and confidence (Section 10.1). Her improvement was achieved through her hard work and the intervention of the study.

After the analysis of the quantitative data and the case studies, there is enough evidence to demonstrate that the intervention of the school-based, on-site and ongoing program with training sessions and PAR activities helped increase teachers’ perceptions of their own IT skills and self-efficacy when using IT in teaching. The results will be utilised in the next chapter to postulate a professional development model for promoting teachers’ effective integration of IT in teaching.
CHAPTER 11 DISCUSSIONS AND CONCLUSION

11.1 CHAPTER OVERVIEW

This thesis sought to explore the effectiveness of a professional development initiative that supported teachers incorporating IT into teaching in a Hong Kong primary school. In doing so, it was necessary to identify those issues that enhance professional development and to postulate a model for professional development which accommodates international research but acknowledges the specific issues relevant to Hong Kong (Section 1.6). The literature review proposed that the framework for an effective professional development program should incorporate certain features. The feature of the program would be school-based, on-site and ongoing, with training sessions taught by peers within a Participatory Action Research approach (Section 2.9). It was also recognised that Bandura’s (1977b) Social Cognitive Theory and Rogers’ (1995) Diffusion of Innovation Theory could inform the study to describe, explain and theorise the change in teachers’ practice (Section 2.8).

The study adopted a Case-study approach (Section 3.3) situated in a school in Hong Kong (Philanthropy Primary School) and incorporated both qualitative and quantitative data (Section 3.4.3). The contextual analysis in which this study was situated was presented in Chapter Four, the quantitative analysis of the data collected from the surveys and timetables in Chapter Five, and the qualitative study of the cases in chapters Six to Ten.

This chapter recapitulates on how IT was being used in Philanthropy Primary School from the commencement to the end of the study in order to highlight how the aims of the study have been accomplished. To this end, the chapter examines the first research question – “What are the antecedent and contextual factors that influence current practice?” (Section 1.7) and draws upon an analysis of the contextual barriers and incentives that impact on the promotion of IT in teaching in Hong Kong to locate the intervention in a historical and socio-cultural matrix. The second task of the chapter is to examine the second research question – “What are the effects of a professional development initiative on teachers’ integration of IT in teaching?” (Section 1.7) by exploring the effectiveness of curriculum change though the professional
development program. Informed by the literature and supported by the evidence from the study, the research questions are answered. The findings are summarised to provide an answer to the effectiveness of curriculum change through the intervention.

Informed by both the literature and the findings of the study, a professional development model is postulated. The issues, problems and limitations of the study are examined in order to draw from the study implications for professional development strategies in the Hong Kong context and how educational issues and the culture of teaching and learning in Hong Kong can accommodate theory.

11.2 WHAT ARE THE ANTECEDENT AND CONTEXTUAL FACTORS THAT INFLUENCE CURRENT PRACTICE?

In order to achieve change in practice, an in-depth understanding of the barriers and incentives confronting local participants is necessary (Grol & Wensing, 2004). Two of the research questions were focussing on finding out how, and in what ways, computers were being used in current practices. The barriers and incentives in promoting IT in teaching were identified in Chapter Four: Results of Contextual Analysis. The findings are discussed below.

11.2.1 BARRIERS IN INCORPORATING IT IN TEACHING

Four significant barriers that hindered the incorporation of IT in teaching by teachers at Philanthropy Primary School were observed in the two years of the study (Section 2.7). These barriers were cultural, infrastructural, resource related, and personal.

11.2.1.1 CULTURAL BARRIERS

Three cultural factors were identified, namely, a highly traditional examination-based education system, frequent imposed education reforms, and the nature of Chinese characters. As noted in Section 2.7.1, Hong Kong is a Confucian-Heritage Culture (Watkins & Biggs, 2001) with the implantation of British institutions over 150 years under British rule. Both cultures have strongly emphasised formal examination as part of the education system. They have had a deep influence on the Hong Kong education system and have shaped
it into an examination-oriented, norm-referenced, subject-based, highly segregated and schedule-tight structure (Section 2.7.1). Although the British Colonial and the HKSAR government saw problems in the education system and wanted to introduce a series of reforms, policy direction was often plagued by contradictions. Lo (2000) described these contradictions as a developmental paradox embodying the co-existence of elitist and egalitarian ideas in reform endeavours, the simultaneous application of draconian and humanistic methods in education, the concomitant adoption of authoritarian and democratic styles of administration, and the delicate manipulation of bureaucratic control and professional autonomy. (p. 240)

From the findings reported in Section 4.3.3.1, it is clear that teachers’ practices have been deeply influenced by the schedule-tight, examination-oriented, and performance oriented culture and atmosphere. Teachers at Philanthropy were hesitant to try innovative teaching approaches that might impact negatively on their students’ examination results.

A second cultural factor related to the effect of frequent “Tiger-head, Snake-tail” reforms. Using IT in teaching is one of the education reforms. Immediately following this reform are other reforms were introduced, for example the “Learning to Learn” and the “Life-wide Learning”. After working intensely in 2000-2001 on the introduction of IT in education reform, teachers had then to direct their energy to attend seminars and briefings on “Learning to Learn” and “Life-wide Learning” in 2001-2002 and the following years (Sections 4.3.3.4 and 9.5.1). Teachers had become accustomed to the reforms and developed tactics of superficial conformity. Thus, in this context, with apparent unconnected reform agenda teachers became cynical and in general their engagement in change was often a token engagement. Even in this study, there were teachers who answered the items in the surveys with the same options throughout each section. These cynical teachers had to be excluded from the study reducing the number of valid participants from 40 to 31. These findings corroborate the literature which identifies teacher burnout (HKPTU, 2001, 2003; Lo, 2000) described in Section 2.7.5.2 and teacher apathy (Morris, 1992) described in Section 2.7.4.2 as significant inhibitors of change (Pihulyk, 2002).

The third significant cultural factor related to the nature of Chinese
scripts, especially in Hong Kong. As explained in Sections 2.7.6 and 4.3.3.4, Chinese characters are graphical. Inputting Chinese into the computer is a substantial barrier that prevents teachers from using computers to prepare teaching materials and asking students to word-process their projects or assignments. As mentioned in Section 2.7.6 although students can use writing tablets to enter Chinese characters into the computer slowly, it is error-prone and the success rate of tablets is low for young pupils. Although teachers had not mentioned the difficulties of Chinese text input their students might encounter, the variety of input methods used by teachers shown in Table 4.3 of Section 4.3.3.5 demonstrated teachers’ attempt to overcome their own difficulty in Chinese text entry. An important task of using computers routinely as part of data collection, analysis, summary and report writing is greatly hampered by the lack of simple, easy to use, fast and efficient input methods.

11.2.1.2 INFRASTRUCTURAL BARRIERS

The physical environment was also identified as a substantial barrier principally because of the architecture of the school building (Section 4.3.1). The school is a single block matchbox type estate primary school built in 1970, based on a standard 1960s design. Because it has very limited space, teachers identified the accommodation of computers and peripherals, network servers, and trunks for cables as problematic. There was also little space for students and teachers to use IT effectively in the classroom and staff room respectively (Sections 4.3.1.3 and 4.3.1.4).

11.2.1.3 LIMITED RESOURCES

Philanthropy Primary School is an aided school whose finance is tightly controlled by the government. With the limited funding, the school authorities had to set priorities on the budget. Emerging from the analysis of the context in Chapter Four and case studies in Chapters Six to Ten was that limited space constrained the accommodation of equipment. Philanthropy Primary School thus had only limited number of computers and peripherals which were fully engaged during and after school, as pointed out by David in Section 7.7.2.2. Equipment failure due to heavy usage and vandalism also added to pressure on resources. There was a lack of access to hardware and software by students,
especially those of low economic status, which had brought forth perceived equity issues (Sections 8.6.1 and 8.7.2.2). The lack of teaching software was identified by teachers who used IT in a teacher-centred expository approach where the software had to be closely related to the topic of the lessons (Section 4.3.2.3). The poor performance of the network system which provided only group accounts with no capacity limits and security measures and the inability to access the Internet in classrooms inhibited teachers using IT in their teaching (Flora, 8.5.1; Section 4.3.2.4). The backward incompatibility of versions and the short life cycles of software packages forced teachers to learn, unlearn and relearn frequently (Flora, 6.4.1). When these problems happened in the classroom, teachers felt embarrassed and their authority eroded (Flora, 8.5.1; Susan, 9.7.2). Therefore, teachers either resisted or were indifferent to the use of IT in teaching. They believed that using IT would increase their burden and weaken their control of the classroom even though they might also believe that there were benefits to their students’ learning. These findings are consistent with that identified by Cuban (1986). Thus, the computer system itself was a barrier to teachers’ use of IT in teaching.

11.2.1.4 PERSONAL BARRIERS

Personal barriers included teachers’ time, knowledge and professional development. As revealed in Sections 6.2, 6.4.1, 6.7.2.1, 6.9, 7.7, 8.4.1, 8.9, 9.7.2, teachers in Hong Kong were extremely “time poor”. Over-worked teachers had to invest extra time during evening and weekends to acquire the needed computer training and setting up and arranging equipment, as confirmed by research overseas (Amos, 1998; Ertmer et al., 1999; Jewell et al., (n.d.); Sandholtz et al., 1997)

After participating in training programs organised by tertiary institutions and private companies endorsed by the Education and Manpower Bureau, teachers still often expressed their concern about not having enough training. For example, teachers in Philanthropy Primary School like Ken, David, Flora and others, despite attending the 120-hour advanced computer courses, did not perceive high IT skills and self-efficacy when using IT in teaching (Sections 6.4, 6.5, 7.4, 7.5, 8.4, and 8.5). It was very difficult for institutions to cater for the wide range of abilities and meet teachers’ real needs. It was even more
difficult to organise training on pedagogical applications of IT in teaching because few instructors who were good at IT were also knowledgeable in pedagogical applications of IT. As revealed by Ken in his interview, the instructors of the first 120-hour advanced course had difficulty determining what the teachers needed, and they ignored teachers’ levels of understanding. Because teachers were time poor and lacked knowledge of the pedagogy of IT, their usage of IT was limited (Section 8.4.1).

11.2.2 INCENTIVES FOR INCORPORATING IT IN TEACHING

This study revealed a number of incentives that encouraged teachers to embed IT in their teaching. Three major incentives were related to the external pressures imposed by the education authority, awareness of the inherent advantages of IT and a supportive climate of change in the school.

11.2.2.1 EMB STIPULATION

EMB provided a substantial external incentive for teachers to adopt and engage in the use of IT in teaching. Providing evidence of higher competence levels was advantageous in teachers’ promotion or transfers to other schools. Conversely, the perception existed that the inability to provide evidence of the required IT competence could cause termination of employment. Hence, there was substantial pressure on teachers from the Education and Manpower Bureau to update their knowledge of IT. This factor was particularly significant in an employment situation when there were excess teachers and declining student numbers. This pressure to adopt an innovation is consistent with Rogers’ (1995) classification scheme for the adoption of innovation, by authority.

11.2.2.2 TEACHERS’ AWARENESS OF THE ADVANTAGES OF INCORPORATING IT IN TEACHING

Data from teachers’ formal and informal interviews and daily contacts revealed that teachers at Philanthropy Primary School were influenced by the government, the EMB, the principals, colleagues, press, and TV that IT is good for teaching and learning. They were persuaded and held positive views towards incorporating IT in teaching and believed that IT can enhance students’ learning (Bandura, 1977b). Teachers’ awareness of the advantages of incorporating IT in teaching was identified as an incentive to adopt IT. This
behaviour is consistent with Rogers’ (1995) knowledge, persuasion and decision stages of diffusion of innovation. As teachers were informed of the innovation by repeated presentation of information about the program, they became more familiar with it, discussed the implications, began to show interest and acceptance, and finally adopted the new practices. This behaviour is also consistent with the finding of Sandholtz et al. (1997) who showed that lasting change in the classroom must be accompanied by changes in teachers’ beliefs about the purposes and nature of instruction.

11.2.2.3 SCHOOL SUPPORT

The importance of leadership shown by the principal of Philanthropy Primary School in mobilising teachers in the pursuit of IT was discussed in Section 4.4.2. The school administration and teachers believed IT was beneficial to teaching and learning, and envisaged incorporating IT as a way to promote the image of the school, which would improve its survival. In a hostile environment where the school premises were old and deteriorating there was fierce competition for new students. Teachers and the school administration saw very clearly the urgency and necessity for change, so there was a tight alignment of teachers’ beliefs and school goals. Hence, teachers were supported to participate in the training sessions and tutors were given a lighter teaching load so that they could have time to prepare and develop teaching materials. The provision of support at key stages was therefore an important factor for success during the implementation of new initiatives. This practice is consistent with the findings of Kotter (1996) who demonstrated that leadership, effective communication, a tight alignment of people and organisational goals, adequate training and funding, and a clear compelling reasons for change contribute to successful change efforts (Section 4.4.2).

11.2.3 SUMMARY OF SITUATIONAL ANALYSIS

In summary, the situational analysis has revealed that the Hong Kong education system has shaped a didactic, expository, teacher-centred and teacher-directed, approach to schooling. Teachers have to cover the scheduled content in a specified duration of time so that they can prepare students for examinations. The poor infrastructure, lack of space and equipment and
resources became major barriers preventing teachers from using IT in teaching effectively. The size and classroom setting, students’ lack of experience with project and independent learning, difficult Chinese text entry, and parents’ inability to provide their children with a home computer and the required software, made doing projects very difficult, if not impossible. The many education reforms with momentum of avalanche and tsunami right at their heels have created enormous pressure on teachers, forcing them to overwork unrelentingly and leaving them little time for whole-hearted concentration on their study of IT. However, teachers at Philanthropy Primary School, although they faced more barriers than those in schools with better buildings and facilities, demonstrated significant changes in their behaviours and beliefs after the professional development initiative.

11.3 EXPLORATION OF EFFECTIVE CURRICULUM CHANGE

The second research question focussed on exploring the effects of a professional development initiative on teachers’ integration of IT in teaching. The literature review identified important issues that underpin effective change which relate to teacher perceptions, self-efficacy and entrenched practices (Section 2.8). These issues guided the selection and interpretation of data. The answers to the research question are explored by examining the indicators of these issues.

1) What will be the change in teachers’ perception of their IT skills as a result of the intervention?

2) What will be the change in their self-efficacy as a result of the intervention?

3) What are the teachers’ common strategies when using IT in their teaching?

4) What are the changes in teachers’ practice?

11.3.1 INDICATOR ONE: THE CHANGE IN PERCEPTION OF TEACHERS’ IT SKILLS AS A RESULT OF THE INTERVENTION

From the results revealed in Section 5.2.3, the pairwise comparisons of the differences in frequencies of use of computers by teachers of Philanthropy
Primary School before and after one year of the study was \( t(30) = -2.619, p < .05 \) and effect size = 0.53. There was a significant increase in teachers’ frequency of using computers. The frequency of using computers was sustained with some increase in the second year. The overall increase in the frequency of computer use as a result of the intervention is statistically significant, \( t(30) = -3.978, p < .01 \) and effect size = 0.61. Thus, the intervention had caused positive effects on all teachers of Philanthropy Primary School, young and old, female and male. Quite contrary to common beliefs that older people are more technophobic in general (Brosnan, 1998), the change in frequency in using computers among senior teachers (over 50 years of age) at Philanthropy Primary School increased more than for younger teachers (Section 5.2.5). Older teachers (aged 41 and above) reported lower IT knowledge, skills and capabilities in general (Section 5.3.5). The data also indicate that the intervention was more effective with teachers with lower IT skills and capabilities in the third survey at the completion of the study (Sections 5.2.5 & 5.2.6).

Analysis in Section 5.3.1 showed that the paired samples test of teachers’ perceptions of their own IT skills. There was a significant increase in teachers’ perceptions of their own IT skills, \( t(30) = -6.751, p < .01 \) and effect size = 0.85, after the first year of the intervention. These results suggest teachers were competent to use IT. They could operate the computers with more confidence, run IT-based teaching materials, and design multimedia Microsoft PowerPoint® slides for teaching. Ken (Section 6.4, last paragraph), David (7.12, first paragraph), Susan (9.8) and other teachers (from their portfolios) attributed the increase to the school-based training by taught by peers. They described themselves and other teachers during the training sessions as enthusiastic, eager to gain knowledge and skills to complete the required tasks for attaining the IT competence level. They were proud of their achievements after the training sessions (Sara, Section 10.1). The increase in teachers’ perceptions of their own IT skills was significant for nearly all teachers. It was higher for teachers with low initial perceptions of their own IT skills because they started by knowing little about IT. They had a substantial jump of two levels. The advantages and limitations of peer-tutoring identified in section 2.9.1.1.4 corroborate with the
findings of Guskey (2000) and Sparks and Loucks-Horsley (1990) that tutors also learnt through preparing for the training courses, teaching, answering participants’ questions, and finding out solutions for the participants. Tutors in the study also showed an increase in their perceptions of their own IT skills (section 5.3.5), but since they were in a higher level already, the percentage increase was not as high as teachers with low initial perceptions.

Teachers’ perceptions of their own IT skills reported in the questionnaire survey after another year of 32 weeks of PAR activities recorded a significant decrease, $t(30) = 3.448, p < .01$ with effect size = -0.57. Teachers gave different interpretations for the decrease in their perceptions of their own IT skills. Some teachers with medium or low perceptions (Ken, Section 6.5.1; Flora, Section 8.5.1) explained that they were involved in other school activities like taking part in sport competitions and had to spend time preparing students, and others (Susan, Section 9.5.1) complained that they were forced to entertain the new education reform, so they did not have the time to prepare teaching materials.

IT Team member, David, argued their skills did not decrease because many of them were taking more advanced IT courses in tertiary institutions. It was impossible for them to have lower IT skills. However, when they used IT in higher-level applications, it would require the application of advanced skills, which they felt unsure about. So they felt they could not claim “Expert” any more (Section 7.11). Detailed investigation of the numbers of teachers claiming different levels of perceptions revealed that there was an overall increase in the perceptions from before the intervention to the end of the first year of intervention after the training sessions and PAR. The decrease in the second year was mainly due to the decrease in the number of teachers claiming “Expert” level (Section 5.3.6). This result confirmed teachers’ explanation that their skills were not lower, but because of modesty (Huang, 2002; Salili, 2001), they scored themselves one level lower than the “Expert” level. The overall effect of the intervention was that teachers’ perceptions of their own IT skills increased significantly, $t(30) = -2.573, p < .05$ with effect size = 0.40, despite the recorded drop in the second year. As most teachers, especially those with low initial perceptions, had not taken any other courses during this period of time except those offered through the intervention, their increase in perceptions
can therefore be attributed to the intervention (Section 8.7 and 10.3). The evidence summarised above answers research question two that the professional development initiative contributed to the overall significant increase in teachers’ actual skills and their perceptions of their own IT skills, and enabled them to use IT in their classroom teaching.

11.3.2 INDICATOR TWO: THE CHANGE IN SELF-EFFICACY AS A RESULT OF THE INTERVENTION

During the training sessions, teachers had hands-on exercises to use Microsoft Word® to prepare a lesson plan which had some simple video segments; use Microsoft PowerPoint® to prepare a multimedia presentation used in teaching of a particular topic, and web materials to be uploaded to the Intranet. After the successful accomplishment of these hands-on activities, teachers gained performance experience (Bandura, 1977b). Through observing the researcher, tutors and other teachers in their teaching and demonstrations, teachers learned vicariously (Bandura, 1977b). After the mastery of the required knowledge and skills in using IT, teachers were persuaded by the researcher and the tutors to try using IT in their teaching. They were also coached and encouraged to believe that they were highly competent. This strategy was designed to enhance their self-efficacy (Bandura, 1977b). As it was the first time the pupils experienced the lively and attractive multimedia Microsoft PowerPoint® slides with sound, graphics and animations, they were excited, fascinated and motivated. Teachers believed that to use Microsoft PowerPoint® would arouse the interest of students to learning than the use of traditional teaching methods (Section 10.2). David expressed similar views and thought that even for the most boring topic, Microsoft PowerPoint® slides could motivate students’ interest, focus their intention, and enhance their learning (Section 7.1). Flora also expressed in her interview that IT could provide multisensory stimulation which help students to learn effectively so that she could teach two lessons in two periods, which had never happened before. She believed that teachers should be shown the new horizon teaching with IT could provide (Section 8.5.1). There was therefore, a statistically significant increase in teachers’ self-efficacy in using IT in teaching, \( t(30) = -6.867, p < .01 \) with effect size = 1.21.
In the second year, only PAR meetings were held and two training sessions delivered. At this time the focus within the school began to shift from technology in order to address the newer education reforms. When the novelty effect faded, and teachers’ attempts to engage in advanced applications of IT were affected by difficulties, teachers’ unsuccessful attempts impacted on their self-efficacy and perceptions of their abilities in using IT. They complained in their portfolios that they spent a long time searching for suitable teaching materials from the Internet and the Microsoft PowerPoint® slide show (Section 10.2 and 10.3). They also faced some technical problems: the problems of hardware, software and auxiliary equipment (Section 10.3). In addition, Flora expressed concern in her interviews that there were problems with the computers, the network and the teaching platform. Some teaching materials did not play properly and sound effects did not manifest as intended. Students could not save files, or when they were able to save files other students erased them (Section 8.5.1). Flora also complained about the incompatibility between versions of the same software package (Section 8.4.1). David and other IT Team members admitted the Network problems but could not solve them because of funding, technical and knowledge implications (Sections 7.5 and 7.7.3.4). The frequent problems with computers, the network and the increasing expectations from the students had a negative impact on teachers’ self-efficacy in using IT in teaching. There was a significant decrease in teachers’ self-efficacy at the end of the study, \( t(30) = 3.443, p < .01 \) and effect size = -0.49. But since the increase in self-efficacy due to the school-based training and trial teaching during the first year of the study was so high that the overall increase in self-efficacy over the whole study was still significant at .01 level, \( t(30) = -3.32, p < .01 \) with effect size = 0.67.

The intervention provided opportunities for IT competent teachers to share their experience with their senior colleagues, and helped them to acquire knowledge, skills, and confidence. Teachers’ overall self-efficacy increased, as shown in Section 5.3.1. Teachers became competent in using IT in their teaching. The 25 strategies incorporating IT in teaching had become part of their practical pedagogical repertoire.
11.3.3 INDICATOR THREE: THE COMMON STRATEGIES IN USING IT IN TEACHING

From the analysis of data from surveys, timetable reports and interviews, it was found in Section 5.6.1 that teachers’ common strategies when using IT in teaching in the first year 2000-01 were mainly focused on using presentation software either controlled by the teachers or assisted by students. Using IT to create a learning environment with multimedia effects to motivate students and assist teaching explanations was significant compared with other strategies. In the second year 2001-02, IT was used to create a learning environment and as motivation and explanation tool as in the first year, but there was a large increase in the use of ETV and cassette/CD in teaching. The choice of these strategies is understandable given the traditional nature of the Hong Kong school system (Section 2.7) in which teachers have to prepare students for their examinations. As reported in Section 4.3.3.1, it was found that Hong Kong textbooks were directive and prescriptive, and “teacher-proof”; subject panels were required to set teaching schedules for teachers to follow; and teachers had to observe the schedules closely. Teacher-centred, didactic teaching approaches with drill and practice were the norm (Section 4.3.3.2), an observation which agreed with F. Leung’s analysis of mathematics teaching (1999). When teachers used IT in teaching, most of them conformed to the norm. They hoped that, amid the dry, dull and uninteresting methods of “duck-force-feeding” in teaching, using IT could bring in multi-sensory stimuli which would help students understand and facilitate teachers’ teaching in the didactic teaching approach. Since ETV was designed to supplement the topics in the syllabus with multimedia effects and stories, using ETV CD-ROMs suited teachers’ practice of creating a learning environment to motivate students to listen and explain the concepts. These conclusions agree with the observation of Salili (2001) as described in Section 2.7.1.7. Most of the teachers in Hong Kong adjusted their current practice, hoping that IT would make teaching more effective or efficient, leaving underlying beliefs about teaching and learning unchanged.
11.3.4 INDICATOR FOUR: THE CHANGES IN TEACHERS’ PRACTICE

Despite the nature of classroom teaching and all the barriers, evidence derived from teachers’ responses in questionnaire surveys, timetable reports, interviews, classroom observations, records of meetings, portfolios, and school documents demonstrates there were changes in teachers’ practice, as reported in Chapters Four to Ten. The changes in teachers’ practice can be viewed in two dimensions. The first dimension describes the change in the number of times teachers used IT in teaching various subjects. The second dimension describes the paradigm shift in teachers’ roles.

11.3.4.1 FIRST DIMENSION: CHANGES IN THE NUMBER OF TIMES TEACHERS USED IT IN TEACHING

As a simple indication of teachers’ change after the intervention, two quantitative changes in teachers’ practice were observed, namely, teachers’ frequency of using computers in general and specifically in classroom teaching of different subjects. As analysed in Section 11.3.1, there was a significant increase in teachers’ frequency of computer use related to teaching.

Despite the constraints all teachers at Philanthropy Primary School did demonstrate an increased application of IT in teaching their own subjects. Analysis of timetable reports showed that the number of strategies incorporating IT in teaching had increased in the second year, though the increase was not statistically significant, but it was practically significant. Teachers became aware of the strength and limitations of using certain strategies after trying many different strategies, very often a few strategies per lesson in the first year of the intervention. So, over time, they became selective in adopting the strategies. They also incorporated IT in teaching in significantly more periods and weeks in the second year than in the first year of the study (Section 5.5). The increase in using IT in teaching was not only sustained, but increased significantly.

11.3.4.2 SECOND DIMENSION: WHAT ARE THE CHANGES IN TEACHERS’ PRACTICE?

As most teachers followed the traditional practice and used IT to create a learning environment in a teacher-centred paradigm to motivate students and
explain concepts, there were some teachers trying to use IT in a more student-centred approach, as analysed in Section 5.6.4 and 5.6.5. Given the barriers identified in Section 4.3, such as the difficulty in Chinese text entry, the lack of home computers and software, the unreliable network system, and teachers’ time constraints, which had made student projects and presentations very difficult, there were teachers who required their students to use the Internet and other sources to search for information for their projects, and present them in the class. The number of such instances was small compared with the traditional approach, but the percentage increase was significant.

11.3.5 SUMMARY OF EFFECTIVE CURRICULUM CHANGE

As reported in previous sections, the significant increases in teachers’ frequency of computer use, perceptions of their own IT skills, and self-efficacy when using IT in teaching are evidence of effective professional development accomplished through the intervention. The significant increase in the number of periods and weeks using strategies incorporating IT in teaching can also be viewed as effective change in teacher practices. Although the culture and education system were preventive in the implementation of curriculum change, many teachers did change practice to use more IT in their teaching, and some attempted student-centred approaches. Teachers’ positive attitudes towards, their sense of empowerment of, and their eagerness in using IT in teaching and their change in teaching practice provide evidence that the professional development program did help teachers to use IT in their teaching.

11.4 KEY ACHIEVEMENTS OF THE STUDY

The aim of the study was to find an effective professional development initiative which could help teachers to incorporate IT into their teaching. Although there were serious barriers as revealed in the situational analysis, which had hampered teachers effective use of IT in teaching, and the Dienes effect (Sierpinska, 1999) of textbooks and tight teaching schedules set by subject panels, which confined teachers to the didactic approach, there was still evidence that teachers at Philanthropy Primary School, after the intervention, had shown statistically significant improvements in their ability, beliefs and practice. The achievements will be described below.
11.4.1 ATTAINMENT OF IT COMPETENCY

The school-based, on-site and ongoing training sessions designed and taught by peers encouraged teachers to acquire IT knowledge and skills is essentially the Type A professional development mentioned by Downes et al. (2001). As described in Section 4.5 and 11.3.4.2, teachers at Philanthropy Primary School attained the IIT and UIT competence levels at the end of school year 2001-02, one year ahead of the stipulated date for all teachers in Hong Kong. From the discussion in Section 4.5 with reference to Appendices L and M, the requirements for attaining the IIT and UIT competence levels are demanding. That teachers at Philanthropy Primary Schools could reach the required level in two years means the first component of the intervention, i.e., the series of training sessions, was effective in helping teachers to acquire the required knowledge, skills and techniques.

11.4.2 CHANGES IN TEACHERS’ PRACTICE COMPARED WITH OTHER STUDIES

After the school-based training program and PAR activities, teachers at Philanthropy Primary School incorporated IT in every subject in the school curriculum. The results of analysis presented in Section 5.6.2 show that there were big increases in the number of strategies incorporating IT in the teaching of various subjects: Putonghua by 365%, tutorial by 288%, English by 142%, and General Studies by 108%, and less prominent increases in other subjects after one year. These results show that teachers changed their practice and their use of IT was not limited to one or two subjects, but spanned the curriculum. This is the Type B professional development (Downes et al., 2001) that teachers used IT to enhance their teaching and students’ learning. Since the school adopts the arrangement that most of the teachers usually teach the subjects they taught in previous years so as to gain more confidence and experience, as can be seen from the case studies, the effects of using different strategies for different subjects on the changes in the number of strategies, lessons and weeks using IT were rather small, if any.

The effectiveness of the intervention is obvious from a comparison with the numbers of strategies and periods incorporating IT in teaching of teachers at Philanthropy Primary School and those reported in a study in 1999/2000.
conducted by Ngan and Lee (2002) with the 1457 teachers of 66 schools, as described in Section 5.5.4. Although the Ngan and Lee study took place one year earlier, the differences in the percentages of teachers using IT were considerable suggesting that teachers at Philanthropy Primary School did make huge progress when incorporating IT in teaching.

As another comparison, the average percentage of time incorporating IT in teaching by teachers in the current study was found to be 5.28% in 2001-02 (Section 5.5.4), while a survey of 152 primary schools conducted by the City University Professional Consultancy Limited (Singtao Education News, 2003a) in May 2003 showed that the average time incorporating IT in teaching by teachers of these schools during school year 2002-03 was less than 5%. It was evident that after the training sessions in the first year, and the PAR activities in both years, teachers used a lot more IT in their teaching of different subjects than those of other schools even one year later. The professional development initiative enabled teachers to change their practice by incorporating IT in their teaching quickly and more effectively than other training.

11.4.3 CHANGES IN TEACHERS’ BELIEFS

As reported in Sections 11.3.1 and 11.3.2, there was a significant increase in teachers’ perceptions of their own IT skills and their self-efficacy when using IT in teaching. Teachers became confident when using IT in teaching after they gained a higher performance (Bandura, 1977b) through attaining the required IT competency. To compare the effect of the professional development initiative with the 120-hour advanced courses on IT in education, teachers who took the latter courses did not show much difference in their beliefs as compared with other teachers who had not taken the courses. But after the intervention of the professional development initiative, teachers showed significant increases in various aspects of their beliefs, namely, the perceptions of their own IT skills and self-efficacy. Schmidt and Kennedy (1990) found that teachers’ beliefs could have a substantial impact on their practices. They also found that teachers’ beliefs could influence not only pedagogical choices but their content choices as well (Schmidt & Kennedy, 1990). In relation to teachers’ change in their beliefs, there were also significant changes in their practices as detailed in Chapter Five and Section 11.4.3. Thus, the professional
development initiative was effective in changing teachers’ beliefs.

11.4.4 TEACHERS EMBRACED IT IN THEIR TEACHING

In interviews, most teachers at Philanthropy Primary School described the enthusiasm with which they used IT in teaching. Many teachers had tried to experiment with incorporating IT in their teaching (Sections 6.10.2 and 7.7.1). They were so enthusiastic that it was sometimes difficult for them to book the MMLC or computer room to teach with IT (Flora, Susan). Teachers had embraced IT and incorporated IT in their teaching. They used IT when it was appropriate, and included IT in their teaching plans consistently throughout the year, and not sporadically over a short time period (Section 5.8). They expressed their joy when they saw students motivated by the multisensory stimulation of Microsoft PowerPoint® presentations, websites, and Audio-visual programs on CD-ROMs (Sections 9.7.1, 10.2, 10.3 and 10.4).

11.4.5 EVIDENCE OF PARADIGM SHIFT

Although EMB encouraged teachers to teach innovatively by shifting their paradigm from teacher to facilitator, and providing more project work to students, there were many barriers for teachers to overcome. Most teachers preferred the safe practices of a didactic, teacher-centred approach, using IT to enhance their teaching (Downes et al., 2001). As analysed in Section 11.3.4.2, some teachers reported using a student-centred approach. Persuasive pressure from authorities persuaded these teachers to try the new approach (Bandura, 1977b). Their successful performance experience enhanced their sense of self-efficacy (Bandura, 1977b) encouraging them to persist with these approaches in the second year. Although the number was limited as described in Section 11.3.4.2, the ratio increase was high and the significance is that teachers felt confident to use IT. There were signs of a paradigm shift after the intervention. Introducing IT has become an integral component of a broader curricular reform (Downes et al., 2001). In fact, there have also been further changes in teachers’ attitudes towards paradigm shift. Teachers became more active in nurturing a student-centred culture. They applied successfully for a Quality Education Fund to set up a campus television which enables students to learn more independently and actively. They have also organised robotic class
for students to enter into competitions locally and in Mainland China, and won an Excellency Award. They are also trying other student-centred activities to engage students and enhance their learning. The effects of the study is long term and expanding in the school.

11.4.6 SUMMARY ON ACHIEVEMENTS

With teachers’ attainment of the required IT competence levels, their significant changes in beliefs and practice, embracing IT in teaching and the evidence of a paradigm shift after the intervention, demonstrates that the professional development initiative is effective in helping teaching integrate IT in teaching. The PAR model can be extended to schools of local regions to form clusters of PAR groups so that experience of one school can be shared among teachers of other schools, with the facilitators of the schools to form members of the PAR groups of the clusters. Thus the effectiveness of PAR extends beyond one school to groups of local schools.

11.5 WHAT HAS BEEN LEARNT IN THIS STUDY

This study has contributed to a better understanding of a number of areas associated with the introduction of IT. Some of these areas are important in using IT in teaching, others are important in professional development programs.

11.5.1 THE INITIATIVE IS EFFECTIVE IN HELPING TEACHERS INTEGRATE IT IN TEACHING

As mentioned in Section 11.4.6, from the results of the study, the professional development initiative is effective in helping teachers integrate IT in their teaching. This demonstrates that this type of professional development is suitable for schools in Hong Kong or other places who may wish to adopt a professional development strategy.

11.5.2 SENSE OF CRISIS IS AN IMPORTANT INCENTIVE

Reflecting on the results of the study, it appears that a sense of crisis is an important incentive for the adoption of innovation. As described in Section 1.51, the closure of schools due to insufficient Primary One pupils coupled with the need to get a new school building and resources for teaching had forced the
principal and teachers of Philanthropy Primary School to work together to find ways to ensure the survival of their school. Teachers were willing to spend their already very limited time on studying and trying using IT in teaching. As the required IT competency attainment affected their job security and promotion, teachers were willing to learn the knowledge, skills and techniques to complete their portfolio. By completing the portfolio, teachers like Sara, Lida and others experienced performance accomplishment and vicarious learning (Bandura, 1977b) which built their confidence to pursue further innovation in their teaching (Sections 10.1 and 10.5). Experience gained from the study tells us that when a country or a state wants to promote IT in education or another innovation, government setting some targets with a fixed time frame will facilitate the introduction and adoption of the innovation.

11.5.3 SCHOOL-BASED PROFESSIONAL DEVELOPMENT MEETS TEACHERS’ NEEDS

Experience with the school-based professional development initiative showed that involving the principal and teachers to determine the aims and objectives of the program ensured that the planners of the professional development program knew the needs of the school and teachers, so they could design activities targeting these needs. Teachers’ differing needs levels were catered for. They can learn and adopt the strategies more easily. The ownership of the professional development program belonged to the school community. School-based professional development programs create a cooperative and collaborative atmosphere so that teachers work together in a harmonious atmosphere, respecting and helping each other. The result is the early adoption (Rogers, 1995) of the innovation, as in the case of the Philanthropy Primary School.

11.5.4 PEER-TUTORING PROVIDES INSTANT HELP

Since tutors were fellow teachers, they knew the standards of the participants, understood their problems, and were aware of topics that were difficult to understand (Rogers, 1995). As they worked in the same school, when a teacher had a problem, he or she could get the right help immediately by addressing the appropriate person. Peer-tutoring was very effective.
11.6 ISSUES AND LIMITATIONS

There were several areas of the study that could be improved. These are the aims of the initiative, the duration of the intervention, the questionnaire used, the hardware and software infrastructure, and the limitation of one school and limited number of teachers.

11.6.1 FOCUS OF THE TRAINING

The intervention aimed at providing teachers with knowledge, techniques and skills when using IT to help them to attain IT competence and empower them when using IT in teaching. Means and Owens (1994) found that early efforts to introduce technology into schools failed because the interventions were based on flawed models of teaching with technology which assured the primacy of content over pedagogy. For this study, due to the limited teaching experience of the younger teachers who served as tutors, and the limited IT knowledge of the experienced teachers, the training sessions were focussed mainly on IT training with little attention to how pedagogy using IT should be practiced. Some younger teachers found IT useful only when students were impressed by its novelty. As there was limited improvement in pedagogy, once the novelty effect subsided, they did not find IT effective (Section 7.11). Experienced teachers like Susan found IT a useful tool for teaching. Although they were limited by the available time and IT knowledge, the teachers overcame the obstacles by involving students to help in setting up, controlling the computer and running the software, hence, they engaged students in their learning (Section 11:10). Given the limited teaching experience of the tutors and the limited IT knowledge and skills of the veteran teachers and the mandate of the government, the current focus of IT knowledge and skills acquisition with some pedagogical knowledge and experience is justified. The next target will be to focus more on pedagogy, and the integration of IT in teaching.

11.6.2 EMPHASIS ON ASSISTING TEACHERS TO TEACH

Since the education system in Hong Kong is examination-oriented, teachers are under great pressure to finish the teaching schedule. They hope to use IT to assist them to teach effectively to cover the syllabus (Sections 7.11.1 and 9.7.1). As pointed out by Cuban (2001), “when teachers adopt
technological innovations, these changes typically maintain rather than alter existing classroom practices“ (p. 71). The study was found to be an effective way to provide teachers with the required knowledge, skills and techniques. If there were more training and sharing sessions on pedagogy using IT tutored by experienced teachers who have used IT in their teaching, teachers could benefit from the sharing, and would be able to use IT to teach effectively.

11.6.3 THE DURATION OF THE STUDY

Integrating IT in teaching involves the acquisition of concepts and knowledge, improvement of skills and techniques, trials and applications of teaching methods, consolidation of experience and understanding, and enhancement of competence and confidence. It needs time for the slow change in attitudes, self-efficacy, and practice. Sandholtz et al. (1997) found that teachers’ “belief systems are remarkably resistant to change” (p. 7), so it takes a long time for them to change. The Apple Classroom of Tomorrow (ACOT, 2004; Sandholtz et al., 1997) took over a decade in order to manifest substantial changes. Due to the limitation of time, effort, support, and other requirements, and teachers being under pressure to work on other education reforms (Section 9.4.1), the study was only two years long. Although there were remarkable changes in teachers at Philanthropy Primary School, the study was not sufficiently long to establish long term substantiality and uptake of IT. During this short period of time, teachers, similar to other professionals (e.g. engineers and physicians), “had been very selective in their daily uses of technology, picking and choosing among those new ones that they can adapt most easily to traditional practices” (Cuban, 2001, p. 151). The adoption of IT in a teacher-centred paradigm, as noted in Section 11.3.3 is consistent with this suggestion. Nevertheless, the study does contribute to our understanding of the processes of change during the introduction of new innovations in technology. If the study is to be repeated, the duration should be long enough to teach the knowledge and skills in the first phase and pedagogy in later phases.

11.6.4 QUESTIONNAIRE

The original instrument to measure self-efficacy was adopted from the MUTEBI (Microcomputer Utilisation in Teaching Efficacy Beliefs Instrument)
developed by Enochs et al. (1993). It was not designed for longitudinal and ethnographic studies. It was designed for American schools only. As noted in Section 2.7.1.7 it is customary for Chinese to be modest (Salili, 2001). They do not show off their knowledge and hence selected second options on the Likert scale rather than the first through modesty (Huang, 2002). When the questionnaire was used in Hong Kong three times in succession, the problems of this Chinese preference for being humble to claim second (Beck, 2003; Jan, 1980) may have affected the results of perceptions of skills (Sections 5.3 and 7.4.1) and self-efficacy beliefs (Sections 5.4). For a longitudinal study in Hong Kong, which lasts for several years, the items in the instrument may have to be revised to take into consideration the Chinese preference as well as the minute changes by expanding from the current four options to a Likert scale of five to seven options.

11.6.5 THE HARDWARE AND SOFTWARE INFRASTRUCTURE

When the study began, there were only four classrooms with computers and projectors, and these computers were not connected to the Internet. The technician was working in the computer room or multimedia language centre, leaving the teachers using the classroom computers on their own.

There were no individual student accounts only group accounts for the whole class, so students could delete other students’ work to claim space for themselves. Students could not save or print their work (Section 8.5.1). Thus, a range of events relating to the state of readiness of the hardware and software had made it difficult for teachers when they tried to use IT in their teaching.

11.6.6 ONE SCHOOL, LIMITED NUMBER OF TEACHERS

Due to limited resources and the time the researcher could afford, one of the limitations of the study was that it involved only one school with 31 teachers. Besides, the location of the school, school infrastructure, student intake, social status of students’ families, other factors made the case rather characteristic of matchbox schools in lower socio-economical estates. Since the researcher spent a lot of time with the teachers, data were collected every day over the two years, thereby establishing a high level of reliability. Virtually all teachers were observed or interviewed, although only four case studies were
reported. These rich experiences however did provide deep understanding of this school and contributed to a strong base for theory generation.

11.7 A MODEL OF PROFESSIONAL DEVELOPMENT

Demonstrated by the literature review and the results of the study, a model of an effective professional development program to facilitate teachers’ incorporation of IT in teaching and learning has emerged. It will be discussed in the following three areas: Requirements, characteristics, and timeline of the study.

11.7.1 THE REQUIREMENTS OF THE MODEL

Drawing from the findings of the Kotter (1996) (section 4.4.2) and that of the study (Sections 4.3.1, 4.3.2, 4.4.2, 4.4.3 and 4.4.5), there are some requirements that have to be satisfied in order to make the intervention effective:

1) The principal must have good leadership strategies which gain the support of the teachers, students and parents, and can persuade and mobilise teachers to participate in the program;

2) Teachers need to have a desire for learning and to cooperate for the well-being of the students and their own professionalism;

3) The infrastructure must be supported to ensure the equipment and technology is up-to-date, properly and efficiently working and supported by a technician.

11.7.2 THE CHARACTERISTICS OF THE MODEL

From the results of the study and suggestions from the literature, an effective professional development model should have a program with the characteristics summarised as follows:

1) It should be school-based so that all teachers and administrators feel committed to the program (Section 2.9.1.1.1);

2) It should be on-site so that the resources of the school can be used in training and in teachers’ teaching and students’ learning immediately after the training (Section 2.9.1.1.2);
3) It should be ongoing so that participants have time to digest and trial, and can clarify when they have doubts (Section 2.9.1.1.3). As teachers’ beliefs take time to change (Section 11.6.3), the duration should be at least three to five years, and the longer the better;

4) There should be a training component so that the participants can learn effectively from the tutors (Section 2.9.1.1). The training programs in the first year should focus on IT knowledge, techniques and skills so that teachers with low IT competence can brush up their skills to handle IT comfortably. In the second and subsequent years, training sessions should focus on IT pedagogy so that teachers know the contemporary learning theories relevant to IT and learn how to use IT effectively to assist students understand and master the content taught;

5) The tutors should be fellow teachers at the school because they know the school and the participants. Although they have better IT knowledge or pedagogy (heterophily), they work in the same environment and behave similarly (homophily), and can put themselves into the same situations as the participants (empathy) (Section 2.8.4.7). With peers as tutors, participants are psychologically safe and the tutors can learn from the peers too (Section 2.9.1.1.4);

6) There should be hands-on activities for participants to practice and certain requirements set as targets for participants to attain their IT competency levels (Section 2.9.1.1.3);

7) There should be a participatory action research (PAR) component where the school authorities set aside a dedicated period of time, free from school administration interference, for teachers to share their experiences and clarify their queries. Participants could take turns to record the points discussed during the PAR meeting, and the minutes should be compiled and sent to a coordinator for remedial action (Section 2.9.1.3). Innovative and effective ways of using IT in teaching and learning used by teachers can be circulated and discussed during PAR meetings;

8) There should be a critical friend to provide support and critical feedback when appropriate. This role includes both evaluation and support. Independent
evaluation is critical for effective program development. An academic at a higher education institution who is knowledgeable both in IT and IT pedagogy would be ideal;

9) Members of the PAR groups should belong to the same subject area, preferably the same level, with a tutor or coordinator as in the “grassroots” model (Section 2.9.2);

10) There should be demonstrations by the tutors and classroom observations by participants on the tutors so that both the observers and tutors can benefit. The observations should not have any evaluation components so that the teachers can share freely and without pressure (2.9.1.2);

11) For continual assessment and monitoring, there should be a longitudinal questionnaire survey on teachers’ frequency of general IT usage and IT in teaching, perceptions of their own IT skills, self-efficacy and outcome expectancy so that their changes can be observed;

12) There should also be timetable reports each week so that by entering the strategies in the timetables, participants can have time to reflect on what they have done, correctly and incorrectly, the issues and problems and their remedies. The timetable reports kept a very reliable record of the progress of the study, and gave the researcher or coordinator timely information on what had gone wrong, when and where so that remedial action could be taken early and the effects of the actions could also be seen.

In short, the professional development model emphasises teachers’ ownership of the program so that they can plan, teach, share and work together to improve their understanding and enhance their mastery of the skills, techniques and pedagogy.

11.7.3 THE INTERVENTION OF THE PROFESSIONAL DEVELOPMENT MODEL

The findings of the study (Section 11.6.3) demonstrated that the duration of the intervention was not long enough. The number of key stages (Section 3.4.4.3) should be extended. The whole process of the intervention are presented in Table 11.1 above, and could last for five or more years. The first year should focus on raising teachers’ IT competence through relevant training
planned conducted by peers. After they are proficient in using IT, the focus should then be on the pedagogical use of IT in the second and subsequent years. There should be hands-on activities to improve teachers’ performance experience, and classroom observation to provide vicarious experience (Bandura, 1977b). It would be necessary for teachers to submit timetable reports as a reflection of the lessons and to be the basis for discussions in the PAR meetings. The surveys, timetable reports and PAR meeting minutes and related records provide continual assessment and monitoring for the results of the intervention.

Table 11.1
The process for an effective professional development model for incorporating IT in Teaching.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third, fourth, … years</th>
<th>Last Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>Survey</td>
<td>Survey</td>
<td>Survey</td>
</tr>
<tr>
<td>Training in IT knowledge</td>
<td>Training in IT pedagogy</td>
<td>Training in IT pedagogy</td>
<td>Training in IT pedagogy</td>
</tr>
<tr>
<td>Timetable reports</td>
<td>Timetable reports</td>
<td>Timetable reports</td>
<td>Timetable reports</td>
</tr>
<tr>
<td>Classroom Observations</td>
<td>Classroom Observations</td>
<td>Classroom Observations</td>
<td>Classroom Observations</td>
</tr>
<tr>
<td>Weekly PAR meetings</td>
<td>Weekly PAR meetings</td>
<td>Weekly PAR meetings</td>
<td>Weekly PAR meetings</td>
</tr>
</tbody>
</table>

11.8 FURTHER RESEARCH

This study has demonstrated that the professional development initiative is effective in improving teachers’ IT competence, perceptions of their IT skills and self-efficacy. However, in the process of the intervention there were issues, problems and limitations worth investigating through future research. These include the following four aspects.

1) Focus on pedagogy: The current study focused on the change process and knowledge growth among teachers primarily in the area of technology literacy. By focusing on IT pedagogy, experienced teachers could be tutors on how to use limited IT knowledge and skills in reforming teaching effectively. Younger teachers who are usually more IT competent could help their peers through their own IT knowledge, and at the same time learn from them. The research question could be: If the focus on IT pedagogy is taught by peers
collaboratively and cooperatively, would the intervention be effective in helping teachers integrate IT in their teaching?

2) Focus on student-centred learning: The current study showed that teachers adopted the teacher-centred didactic approach. As the novelty effect wore off, teachers found using IT not as effective as direct teaching, especially in the examination-oriented culture like Hong Kong. By focusing on student-centred learning, how well could students achieve in their understanding of the topics covered? What kind of assessments should be used to assess students’ achievements?

3) Social status: The current study was done on a match-box school in a low economic status area. By repeating the study in a better equipped school like a Millennium school in a higher social and economic status area with parents who could afford buying the hardware and software, would the results be different? The salient research question would focus on what role higher levels of resourcing and higher expectations of students would make on the uptake of technology.

4) Longitudinal study: Since teachers beliefs take time to change (Sandholtz et al., 1997), and the study was limited to two years, many long-term changes were not revealed. What support would be required in a longitudinal study focusing on teachers’ changes in pedagogy and students’ enhancement in achievement?

11.9 CONCLUSION

In a subject-based, norm-referenced, examination-oriented, segregated, schedule-tight, deficit view school system, teachers are under great pressure from students, parents, peers, school authorities, EMB and the community to enhance their students’ examination results. Although there have been many education reforms, some of them are best practice in the Western world such as the Target-Oriented Curriculum, unfortunately nearly all of them failed when attempted in Hong Kong (Lo, 2000; Morris, Chan & Lo, 1997; Watkins & Biggs, 2001). The direction from EMB (1998) is more a top-down policy and a threat than a real assistance. The infrastructure (Chung & Ngan, 2002) and resources of the school are barriers to teachers using IT in teaching. The
difficulty of Chinese character entry prevents teachers and students using word-processing and email, and greatly limits teachers’ choice of pedagogical approaches.

Despite all barriers mentioned before, the professional development initiative informed by the literature is effective and can serve as a model for other schools in pursuit of integration of IT in teaching. It provides participants with the opportunity to learn the required knowledge, skills and techniques so that teachers can attain the required level of IT competence through hands-on activities, and ongoing and peer assistance. It fosters positive attitudes toward IT, empowers teachers to use IT in their teaching, enhances teachers’ perceptions of their own IT skills and self-efficacy in teaching significantly, causes changes in practice by increasing the use of IT in classroom teaching significantly, and showed some evidence of initial paradigm shift from teacher-centred, content-oriented to student-centred, learning-oriented approaches. Results obtained in the study show impressive achievements compared with results from contemporary research studies (Section 11.4.2). Informed by literature and results of the current study, this school-based professional development model with a program of school-based, on-site and ongoing training sessions planned and conducted by peers with hands-on tasks and PAR activities is an effective professional development model for schools intending to promote the use of IT in teaching.
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APPENDIX A: Chinese Information Technology in Teaching Efficacy Beliefs Instrument (CITITEBI)

Personal:

Gender:  │ Male    │ Female
You have computers at home:  │ Yes     │ No
Are you able to access computer at school or other places?  │ Yes   │ No
You have taken computer training or learn by self-taught:  │ Yes    │ No
Software Learned:  │ WP      │ SP     │ PPT   │ Authorware │ CAL    │ SAMS   │ FrontPage
Frequency of computer access:  │ Never   │ Several times a year │ Once a week │ Several times a week │ At least once a day
What Operating System are you using?  │ No Use  │ Windows 3.1 │ Windows 95 │ Windows 98 │ Windows NT │ Macintosh │ Linux/Unix │ Others
Your age:  │ 17-20   │ 21-25   │ 26-30  │ 31-40   │ 41-50   │ Over 50  │
Years of teaching:  │ First year │ 2-4    │ 5-10   │ 11-20   │ 21-30   │ Over 30  │
Your main teaching subject:  │
Qualifications:  │ 10-year Permit │ Certificate │ Tertiary │ Bachelor Degree │ Master Degree
Position:  │ CM      │ APSM    │ AM     │ PSM    │ SAM     │ Head II  │ PAM     │ Head I  │
My experience in using computers to assist my work:  │ 1-2 years │ 3-4 years │ 5-6 years │ Over 7 years
I know how to use Chinese Input Methods:  │ Cannot  │ Canton  │ Simplified
Abilities in Using computers

<table>
<thead>
<tr>
<th>Abilities in using computers &amp; IT</th>
<th>C</th>
<th>A</th>
<th>N</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to install hard drive, CPU, Motherboard, Floppy Drive, Keyboard, Monitor, Printer or Scanner</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to install software</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to format a disk</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use word processing system</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use tables in word processing system</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use graphics in word processing system</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>I know how to use Spreadsheet</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use a database program</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>I know how to use a scanner</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to write computer programs</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use Microsoft PowerPoint® Present</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to design Microsoft PowerPoint® Presentation</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I know how to use computers in creating graphics or music</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I use the Internet</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>I use email</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>1</td>
<td>I like to use computers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I have already had sufficient knowledge and skills to use computers in teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Appropriate use of CAL can enhance students’ learning interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Using IT in teaching is a trend</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>I am satisfied with my results of using IT in teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Using computers can raise my working efficiency</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>I don’t feel difficult to advise students how to use computers in their study</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>When teachers can use computers effectively in teaching, students’ attitudes in using IT in learning will become more positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>School should promote strongly the application of IT in teaching</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>I am often able to use computers effectively as an assisting teaching tool in the classroom</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>I’m not afraid of using computers</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>I know how to follow the steps to use computer effectively as tool to aid teaching</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13</td>
<td>Teachers should cultivate students to use IT in learning effectively</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>ED should provide more resources to help schools using IT in teaching</td>
<td></td>
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</tr>
<tr>
<td>15</td>
<td>If possible, I will use computers to teach in the classroom by any means</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I have confidence in using computers at work</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>17</td>
<td>I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>The effect of teaching can be improved if teachers are willing to pay an effort in using CAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Teachers should put in effort to learn to apply IT in teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>I know how to get students use computers to study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Excellent use of computers in teaching can improve students’ learning outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>I can always answer students’ questions relating to using computers in study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I know how to manage effectively the learning environment of using computers in the classroom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>I use computers at work</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B: Chinese Information Technology in Teaching Efficacy Beliefs Instrument (CITITEBI)

Second Questionnaire

Personal:
1. Gender:  ○ Male  ○ Female
2. I have computers at home:  ○ Yes  ○ No
3. I am able to access computer at school or other places?  ○ Yes  ○ No
4. I have taken computer training or learn by self-taught format:  ○ Yes  ○ No
5. Software Learned:  ○ WP  ○ SP  ○ PPT  ○ Web Design  ○ Authorware  ○ CAL  ○ SAMS
6. Frequency of computer access:  ○ Never  ○ Several times a year  ○ Once a week  ○ Several times a week  ○ At least once a day
9. Years of teaching:  ○ First year  ○ 2-4  ○ 5-10  ○ 11-20  ○ 21-30  ○ Over 30
10. Main teaching subject: ____________________________________________
11. Qualifications:  ○ 10-year Permit  ○ Certificate  ○ Tertiary  ○ Bachelor Degree  ○ Master Degree
12. Position:  ○ CM  ○ APSM  ○ AM  ○ PSM  ○ SAM  ○ Head II  ○ PAM  ○ Head I
13. My experience in using computers to assist my work:  ○ 1-2 years  ○ 3-4 years  ○ 5-6 years  ○ Over 7 years
14. I know how to use Chinese Input Methods:  ○ Cannot  ○ Canton  ○ Simplified  ○ Changjie  ○ Fast  ○ Others

Part B: School Facilities

<table>
<thead>
<tr>
<th></th>
<th># Computer rooms in the school (Exclude MMLC)</th>
<th>○ No ○ 1 ○ 2 ○ 3 ○ 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td># Multimedia Learning Centre (MMLC)</td>
<td>○ No ○ 1 ○ 2 ○ 3 ○ 4</td>
</tr>
<tr>
<td>2</td>
<td>Classrooms with LCD Projector</td>
<td>○ No ○ Yes (How many)</td>
</tr>
<tr>
<td>3</td>
<td>Trolleys for LCD Projector</td>
<td>○ No ○ Yes (How many)</td>
</tr>
</tbody>
</table>

5. The facilities in the computer room include:
○ Computers (How many)  ○ LCD  ○ OHP  ○ Visualiser  ○ DVD Player  ○ VCD Player  ○ LD Player  ○ VCR  ○ Tape Recorder
6. The frequencies of computer breakdown in the following places:
<table>
<thead>
<tr>
<th>Computer room</th>
<th>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMLC</td>
<td>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</td>
</tr>
<tr>
<td>Classroom</td>
<td>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</td>
</tr>
<tr>
<td>Notebook</td>
<td>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</td>
</tr>
<tr>
<td>Computer</td>
<td>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</td>
</tr>
<tr>
<td>Other (_______)</td>
<td>○ No Problem ○ Seldom ○ Sometimes ○ Often ○ Frequently ○ Don’t Know ○ Never Used</td>
</tr>
</tbody>
</table>

7. The computer rooms are used for: ○ Computer or IT subject ○ Other subjects ○ Extracurricular Activities ○ Others (_______)

8. The MMLC is for: ○ Chinese ○ English ○ Putonghua ○ Other subjects (_______)

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Do you need to book if you want to teach in the computer room?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>There is a control system linking teacher’s display and students’ display and the projector in computer room</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>There is a control system linking teacher’s display and students’ display and the projector in MMLC</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>The computer room has a fixed opening time (Not after school)</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Can the height of the chairs be adjusted?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Is there any person who will adjust the chairs before the class?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Is the computer room restricted to certain subjects?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Is there any person who connects all the equipment?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>How much time will be spent on connection?</td>
<td>○ 1 min &lt; ○ 1-5 min ○ 6-10 min ○ 11-15 min ○ Over 16 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Does the school provide notebook computers for teachers to use?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Notebooks provided by school are</td>
<td>○ For one person only ○ Shared among a group of teachers ○ For all teachers to book</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Is it convenient for teachers to use computer in teaching?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Due to connection, is it necessary to switch classroom when using IT in teaching?</td>
<td>○ Yes ○ No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>When a computer breaks down in school, the speed of repair is</td>
<td>○ Very slow ○ Rather slow ○ Common ○ Rather fast ○ Very fast</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
23. My evaluations for various aspects of the IT Coordinator are:

<table>
<thead>
<tr>
<th>Competent</th>
<th>○ SD</th>
<th>○ D</th>
<th>○ N</th>
<th>○ A</th>
<th>○ SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>With sufficient professional knowledge in computer</td>
<td>○ SD</td>
<td>○ D</td>
<td>○ N</td>
<td>○ A</td>
<td>○ SA</td>
</tr>
<tr>
<td>With sufficient professional knowledge in teaching</td>
<td>○ SD</td>
<td>○ D</td>
<td>○ N</td>
<td>○ A</td>
<td>○ SA</td>
</tr>
<tr>
<td>Helpful in teachers’ learning and teaching</td>
<td>○ SD</td>
<td>○ D</td>
<td>○ N</td>
<td>○ A</td>
<td>○ SA</td>
</tr>
</tbody>
</table>

24. What problems will students usually have when they use the computer?

### Abilities in Using Computers

<table>
<thead>
<tr>
<th>Abilities in using computers &amp; IT</th>
<th>C</th>
<th>A</th>
<th>N</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to install hard drive, CPU, Motherboard, Floppy Drive, Keyboard, Monitor, Printer or Scanner</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to install software</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to format a disk</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use tables in word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use graphics in word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use Spreadsheet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use a database program</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use a scanner</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to write computer programs</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use Microsoft PowerPoint® Present</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to design Microsoft PowerPoint® Presentation</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use computers in creating graphics or music</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use the Internet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use email</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Self-efficacy

A: SD (Strongly Disagree), B: D (Disagree), C: N (Neutral), D: A (Agree), E: SA (Strongly Agree)

1) I like to use computers
2) I have already had sufficient knowledge and skills to use computers in teaching
3) Appropriate use of CAL can enhance students’ learning interest
4) Using IT in teaching is a trend
5) I am satisfied with my results of using IT in teaching
6) Using computers can raise my working efficiency
7) I don’t feel difficult to advise students how to use computers in their study
8) When teachers can use computers effectively in teaching, students’ attitudes in using IT in learning will become more positive
9) School should promote strongly the application of IT in teaching
10) I am often being unable to use computers effectively as an assisting teaching tool in the classroom
11) I’m not afraid of using computers
12) I know how to follow the steps to use computer effectively as tool to aid teaching
13) Teachers should cultivate students to use IT in learning effectively
14) ED should provide more resources to help schools using IT in teaching
15) If possible, I will use computers to teach in the classroom by any means
16) I have confidence in using computers at work
17) I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom
18) The effect of teaching can be improved if teachers are willing to pay an effort in using CAL
19) Teachers should put in effort to learn to apply IT in teaching
20) I know how to get students use computers to study
21) Excellent use of computers in teaching can improve students’ learning outcomes
22) I can always answer students’ questions relating to using computers in study
23) I know how to manage effectively the learning environment of using computers in the classroom
24) I use computers at work
APPENDIX C: Chinese Information Technology in Teaching Efficacy Beliefs Instrument (CITITEBI)

Third Questionnaire

Personal:

1. Teacher’s Name: _____________________________________________
2. Gender:  ○ Male  ○ Female
3. I have computers at home:  ○ Yes  ○ No
4. Frequency of computer access:  ○ Never  ○ Several times a year  ○ Once a week  ○ Several times a week  ○ At least once a day
7. Years of teaching:  ○ First year  ○ 2-4  ○ 5-10  ○ 11-20  ○ 21-30  ○ Over 30
8. My main teaching areas: _______________________________________
9. Qualifications:  ○ 10-year Permit  ○ Certificate  ○ Tertiary  ○ Bachelor Degree  ○ Master Degree
10. Position:  ○ CM  ○ APSM  ○ AM  ○ PSM  ○ SAM  ○ Head II  ○ PAM  ○ Head I
11. My experience in using computers to assist my work:  ○ 1-2 years  ○ 3-4 years  ○ 5-6 years  ○ Over 7 years
12. Chinese Input Method I use often:  ○ Cannot  ○ Changjie  ○ Simplified  ○ Canton  ○ Fast  ○ Pinyin  ○ Others _________________

Part B: Self-efficacy in using IT in teaching

A: SD (Strongly Disagree), B: D (Disagree), C: N (Neutral), D: A (Agree), E: SA (Strongly Agree)
*Note: The scale is recoded in the reverse order, E (SD) as 1, D (D) as 2, C (N) as 3, B (A) as 4 and A (SA) as 5.

1) I like to use computers
   A  B  C  D  E
   ○  ○  ○  ○  ○
2) I have already had sufficient knowledge and skills to use computers in teaching
   ○  ○  ○  ○  ○
3) Appropriate use of CAL can enhance students’ learning interest
   ○  ○  ○  ○  ○
4) Using computers in teaching is a trend
   ○  ○  ○  ○  ○
5) I am satisfied with my results of using IT in teaching
   ○  ○  ○  ○  ○
6) Using computers can raise my working efficiency
   ○  ○  ○  ○  ○
7) I don’t feel difficult to advise students how to use computers in their study
   ○  ○  ○  ○  ○
8) When teachers can use computers effectively in teaching, students’ attitudes in using IT in learning will become more positive
   ○  ○  ○  ○  ○
9) School should promote strongly the application of IT in teaching

10) I am often able to use computers effectively as an assisting teaching tool in the classroom

11) I’m not afraid of using computers

12) I know how to follow the steps to use computer effectively as tool to aid teaching

13) Teachers should cultivate students to use IT in learning effectively

14) ED should provide more resources to help schools using IT in teaching

15) If possible, I will use computers to teach in the classroom by any means

16) I have confidence in using computers at work

17) I have sufficient computer knowledge and skills to use computers effectively in teaching in the classroom

18) The effect of teaching can be improved if teachers are willing to pay an effort in using CAL

19) Teachers should put in effort to learn to apply IT in teaching

20) I know how to get students use computers to study

21) Excellent use of computers in teaching can improve students’ learning outcomes

22) I can always answer students’ questions relating to using computers in study

23) I know how to manage effectively the learning environment of using computers in the classroom

24) I use computers at work

25) I like to use IT in teaching

26) Using IT in teaching can increase teaching effectiveness

27) Using IT in teaching is a waste of time

28) The hardware at school creates problems when I use IT in teaching

29) The teaching software at school is insufficient

30) Students’ IT abilities are higher than mine

31) I hope to have more trainings relating to using IT in teaching

32) PAR cannot help me solve the problems in using IT in teaching

33) Reduce examinations to make room for time required in using IT in teaching
Part C: The frequencies of computer breakdown in the following places:

<table>
<thead>
<tr>
<th>Place</th>
<th>Never Used</th>
<th>Frequently</th>
<th>Sometimes</th>
<th>Seldom</th>
<th>No Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer room</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMLC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notebook Computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (______________)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The computer rooms are used for:

- Computer or IT subject
- Other subjects
- Extracurricular Activities
- Others (______________)

The MMLC is for:

- Chinese
- English
- Putonghua
- Other subjects (___)

Do you need to book if you want to teach in the computer room?

- Yes
- No

Is there a control system that links teacher’s display and students’ display and the projector in computer room?

- Yes
- No

Is there a control system that links teacher’s display and students’ display and the projector in MMLC?

- Yes
- No

- Yes
- No

Can the height of the chairs be adjusted?

- Yes
- No

Is there any restriction on the opening hours of the computer rooms?

- Yes
- No

Is there any person who will adjust the chairs before the class?

- Yes
- No

Is the computer room restricted to certain subjects?

- Yes
- No

Is there any person who connects all the equipment?

- Yes
- No

Due to connection, is it necessary to switch classroom when using IT in teaching?

- Yes
- No

How much time will be spent on connection?

- 1 min <
- 1-5 min
- 6-10 min
- 11-15 min
- Over 16 min

Is it convenient for teachers to use computer in teaching?

- Yes
- No

My evaluations for various aspects of the IT Coordinator are:

<table>
<thead>
<tr>
<th>Competence</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With sufficient professional knowledge in computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With sufficient professional knowledge in teaching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helpful in teachers’ learning and teaching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Abilities in Using computers

<table>
<thead>
<tr>
<th>Abilities in using computers &amp; IT</th>
<th>Cannot</th>
<th>A little bit</th>
<th>Not bad</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to install hard drive, CPU, Motherboard, Floppy Drive, Keyboard, Monitor, Printer or Scanner</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to install software</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to format a disk</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use tables in word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use graphics in word processing system</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use Spreadsheet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use a database program</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use a scanner</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to write computer programs</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use Microsoft PowerPoint® Present</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to design Microsoft PowerPoint® Presentation</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I know how to use computers in creating graphics or music</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use the Internet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I use email</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
APPENDIX D: Teachers’ Timetable

XXXXXXX 小學

<table>
<thead>
<tr>
<th>老師： XXX(3B)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>節次</th>
<th>時間</th>
<th>星期</th>
<th>一</th>
<th>二</th>
<th>三</th>
<th>四</th>
<th>五</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8:10–8:35</td>
<td>早 禱 / 班 務</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8:35–9:10</td>
<td>英文 1D</td>
<td>音樂 5A</td>
<td>英文 1D</td>
<td>數學 1B</td>
<td>常識 1D</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9:10–9:45</td>
<td>英文 1D</td>
<td>音樂 3C</td>
<td>英文 1D</td>
<td>數學 1B</td>
<td>英文 1D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9:45–9:55</td>
<td>小 息 （一）</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9:55–10:30</td>
<td>數學 1B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>10:30–11:05</td>
<td>音樂 1B</td>
<td></td>
<td>英文 1D</td>
<td>數學 1B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11:05–11:25</td>
<td>小 息 （二）</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>11:25–12:00</td>
<td></td>
<td>數學 1B</td>
<td>音樂 1B</td>
<td>音樂 5A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12:00–12:35</td>
<td></td>
<td>數學 1B</td>
<td>數學 1B</td>
<td>音樂 3C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12:35–1:30</td>
<td>午 餐 / 小 息 （三）</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1:30–2:05</td>
<td>常識 1D</td>
<td>音樂 1D</td>
<td>宗教 1D</td>
<td></td>
<td>導修 1D</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2:05–2:40</td>
<td>常識 1D</td>
<td>英文 1D</td>
<td>導修 1B</td>
<td>常識 1D</td>
<td>週會 / 活動</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2:40–3:15</td>
<td></td>
<td>導修 1D</td>
<td>教研 / 例會</td>
<td>音樂 1D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

資訊科技應用策略

<table>
<thead>
<tr>
<th>資訊科技應用策略</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. 沒有使用資訊科技教學</td>
</tr>
<tr>
<td>1. 老師用簡報教學，老師主導</td>
</tr>
<tr>
<td>2. 用筆記教學，學生參與控制</td>
</tr>
<tr>
<td>3. 用 IT 引起動機</td>
</tr>
<tr>
<td>4. 用 IT 解釋課文</td>
</tr>
<tr>
<td>5. 用 IT 播放 ETV</td>
</tr>
<tr>
<td>6. 開放學習環境</td>
</tr>
<tr>
<td>7. 补習 (補習學習能力不足)</td>
</tr>
<tr>
<td>8. 希望 (課外鼓勵離群上機學習)</td>
</tr>
<tr>
<td>9. 小組輪流應用，每組各有活動</td>
</tr>
<tr>
<td>10. 小組及全體同時學習相同內容</td>
</tr>
<tr>
<td>11. 電腦室學習 (可以和其他組合)</td>
</tr>
<tr>
<td>12. 學生做學習計劃</td>
</tr>
<tr>
<td>13. 學生展示所做的計劃</td>
</tr>
<tr>
<td>14. 學生用 IT 收資料</td>
</tr>
<tr>
<td>15. 學生合作，協同學習</td>
</tr>
<tr>
<td>16. 使用 VCD</td>
</tr>
<tr>
<td>17. 使用投影機</td>
</tr>
<tr>
<td>18. 使用互聯網資源</td>
</tr>
<tr>
<td>19. 實物投影機</td>
</tr>
<tr>
<td>20. Cassette/CD/Video Player/TV</td>
</tr>
<tr>
<td>21.</td>
</tr>
<tr>
<td>22.</td>
</tr>
<tr>
<td>23.</td>
</tr>
<tr>
<td>24.</td>
</tr>
<tr>
<td>25.</td>
</tr>
</tbody>
</table>

應用軟件或網頁名稱：

教後感想：

遇到的困難：

解決方法：

Week2001 / 2002 年度教師上課時間表
APPENDIX E: Outlines of Researcher’s Involvement

Before the Study

An Introduction to the Participatory Action Research Study on 4/9/2000
• Bullet Points of the Presentation by the Researcher
• Collection of Opinions and Background Information
• Current Situations of Schools in Hong Kong
• Conditions of Using ICT in Teaching
• Problems Teachers will face
• Solutions
• School-based, Subject-based Participatory Action Research
• The Content of the Study
• Benefits Provided

Workshop on Development of Multimedia Teaching Programs using Microsoft PowerPoint® on 13/10/2000
• Revision of Textual elements in Microsoft PowerPoint®
• Creation and Manipulations of Tables
• Graphics and Formats, Grabbing Graphics from the Internet and Saving them on the local computer, Manipulations of Graphics
• Creating Sound Files, Inserting and Evoking them in Microsoft PowerPoint®
• Creation of Multimedia Microsoft PowerPoint® Slides
• How to Construct Response Pages
• Setting Hyperlinks to Develop Interactive Multimedia Programs

• Information Technology, School-based, Subject-based, Self Actualisation
• Teaching in a New Era
• Objectives of the Study
• The Role of the Researcher
• The Requirements on the Teachers
• PAR Revisit
• How to Apply IT in Classroom Teaching
## APPENDIX F: School-based IT Training Timetable, 2000-01.

<table>
<thead>
<tr>
<th>Month</th>
<th>Date</th>
<th>Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2(Fri)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I1 Word processing II</td>
</tr>
<tr>
<td></td>
<td>6(Tue)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I2 Presentation Software II</td>
</tr>
<tr>
<td></td>
<td>9(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>Web Resources</td>
</tr>
<tr>
<td></td>
<td>16(Fri)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I3 Multimedia Material Production I</td>
</tr>
<tr>
<td></td>
<td>23(Fri)</td>
<td>3:45-5:15 pm (1.4 Hrs)</td>
<td>I3 Multimedia Material Production I</td>
</tr>
<tr>
<td></td>
<td>2(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I3 Multimedia Material Production I</td>
</tr>
<tr>
<td></td>
<td>8(Thu)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I6 Evaluation of Teaching Software</td>
</tr>
<tr>
<td></td>
<td>9(Fri)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I4 Webpage Design I</td>
</tr>
<tr>
<td></td>
<td>30(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I4 Webpage Design I</td>
</tr>
<tr>
<td></td>
<td>6(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I4 Webpage Design I</td>
</tr>
<tr>
<td></td>
<td>12(Thu)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>Compilation of examination papers</td>
</tr>
<tr>
<td></td>
<td>20(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I5 Applications of Internet/Intranet</td>
</tr>
<tr>
<td></td>
<td>27(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I5 Applications of Internet/Intranet</td>
</tr>
<tr>
<td></td>
<td>4(Fri)</td>
<td>3:30-5:00 pm (1.4 Hrs)</td>
<td>I5 Applications of Internet/Intranet</td>
</tr>
<tr>
<td></td>
<td>8(Tue)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>I9 Applications of Spreadsheet I</td>
</tr>
<tr>
<td></td>
<td>9(Wed)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>Workshop on Personal Teaching Portfolio</td>
</tr>
<tr>
<td></td>
<td>10(Thu)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>Workshop on Personal Teaching Portfolio</td>
</tr>
<tr>
<td></td>
<td>11(Fri)</td>
<td>1:15-4:15 pm (3 Hrs)</td>
<td>Workshop on Personal Teaching Portfolio</td>
</tr>
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</table>
APPENDIX G: Teachers’ Frequencies of Use of Computers

Table G.1

Statistics

<table>
<thead>
<tr>
<th></th>
<th>PRE-FREQ</th>
<th>MID-FREQ</th>
<th>POST-FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Valid</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
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<tr>
<td>Mean</td>
<td></td>
<td>2.48</td>
<td>2.97</td>
</tr>
<tr>
<td>Std. Error of Mean</td>
<td>.173</td>
<td>.157</td>
<td>.150</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>.962</td>
<td>.875</td>
<td>.836</td>
</tr>
<tr>
<td>Variance</td>
<td></td>
<td>.925</td>
<td>.766</td>
</tr>
</tbody>
</table>

Table G.2

Pre-Freq

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>16.1</td>
<td>16.1</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>35.5</td>
<td>51.6</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>32.3</td>
<td>83.9</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>16.1</td>
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</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table G.3

Mid-Freq

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
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<td></td>
<td></td>
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<tr>
<td>1</td>
<td>2</td>
<td>6.5</td>
<td>6.5</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>19.4</td>
<td>25.8</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>45.2</td>
<td>71.0</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>29.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table G.4

Post-Freq

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>22.6</td>
<td>25.8</td>
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<tr>
<td>3</td>
<td>13</td>
<td>41.9</td>
<td>67.7</td>
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<tr>
<td>4</td>
<td>10</td>
<td>32.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100.0</td>
<td>100.0</td>
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</tbody>
</table>

Measure: MEASURE_1

Table G.5

Within-subjects factors

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PREFREQ</td>
</tr>
<tr>
<td>2</td>
<td>MIDFREQ</td>
</tr>
<tr>
<td>3</td>
<td>POSTFREQ</td>
</tr>
</tbody>
</table>
### Table G.6
**Multivariate tests**

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>Pillai’s Trace</th>
<th>Effect</th>
<th>Error df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.347</td>
<td>7.715</td>
<td>2.000</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Wilks’ Lambda</td>
<td>.653</td>
<td>7.715</td>
<td>2.000</td>
</tr>
<tr>
<td></td>
<td>Hotelling’s Trace</td>
<td>.532</td>
<td>7.715</td>
<td>2.000</td>
</tr>
<tr>
<td></td>
<td>Roy’s Largest Root</td>
<td>.532</td>
<td>7.715</td>
<td>2.000</td>
</tr>
</tbody>
</table>

a Exact statistic  
b Design: Intercept Within Subjects Design: FREQUENCY

### Table G.7
**Mauchly’s test of sphericity**

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>Mauchly’s W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
<th>Greenhouse-Geisser</th>
<th>Huynh-Feldt</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>.877</td>
<td>3.810</td>
<td>2</td>
<td>.149</td>
<td>.890</td>
<td>.943</td>
<td>.500</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.  
a May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.  
b Design: Intercept Within Subjects Design: FREQUENCY

### Table G.8
**Tests of within-subjects effects**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQUENCY</td>
<td>Sphericity Assumed</td>
<td>5.570</td>
<td>2</td>
<td>2.785</td>
<td>7.032</td>
<td>.002</td>
<td>.190</td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>5.570</td>
<td>1.781</td>
<td>3.128</td>
<td>7.032</td>
<td>.003</td>
<td>.190</td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>5.570</td>
<td>1.885</td>
<td>2.954</td>
<td>7.032</td>
<td>.002</td>
<td>.190</td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>5.570</td>
<td>1.000</td>
<td>5.570</td>
<td>7.032</td>
<td>.013</td>
<td>.190</td>
</tr>
<tr>
<td>Error (FREQUENCY)</td>
<td>Sphericity Assumed</td>
<td>23.763</td>
<td>60</td>
<td>.396</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>23.763</td>
<td>53.423</td>
<td>.445</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>23.763</td>
<td>56.561</td>
<td>.420</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>23.763</td>
<td>30.000</td>
<td>.792</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Measure: MEASURE_1

### Table G.9
**Tests of within-subjects contrasts**

<table>
<thead>
<tr>
<th>Source</th>
<th>FREQUENCY</th>
<th>Type III</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQUENCY</td>
<td>Linear</td>
<td>4.661</td>
<td>1</td>
<td>4.661</td>
<td>15.821</td>
<td>.000</td>
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</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>.909</td>
<td>1</td>
<td>.909</td>
<td>1.826</td>
<td>.187</td>
<td></td>
</tr>
<tr>
<td>Error (FREQUENCY)</td>
<td>Linear</td>
<td>8.839</td>
<td>30</td>
<td>.295</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>14.925</td>
<td>30</td>
<td>.497</td>
<td></td>
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</tbody>
</table>
Measure: MEASURE_1
Transformed Variable: Average

Table G.10

Tests of between-subjects effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>743.753</td>
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<td>743.753</td>
<td>465.680</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>47.914</td>
<td>30</td>
<td>1.597</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX H: Teachers’ Perceptions of their Own ICT Skills

Table H.1
Statistics

<table>
<thead>
<tr>
<th></th>
<th>PrITS</th>
<th>MITS</th>
<th>PoITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
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<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>14</td>
<td>21.677</td>
<td>17.323</td>
</tr>
<tr>
<td>Std. Error of Mean</td>
<td>1.715</td>
<td>1.513</td>
<td>1.198</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>9.546</td>
<td>8.424</td>
<td>6.670</td>
</tr>
<tr>
<td>Variance</td>
<td>91.133</td>
<td>70.959</td>
<td>44.492</td>
</tr>
</tbody>
</table>

Measure: MEASURE_1

Table H.2
Within-subjects factors

<table>
<thead>
<tr>
<th>ITSKILLS</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRITS</td>
</tr>
<tr>
<td>2</td>
<td>MITS</td>
</tr>
<tr>
<td>3</td>
<td>PoITS</td>
</tr>
</tbody>
</table>

Table H.3
Descriptive statistics

<table>
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<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrITS</td>
<td>14</td>
<td>9.546</td>
<td>31</td>
</tr>
<tr>
<td>MITS</td>
<td>21.677</td>
<td>8.424</td>
<td>31</td>
</tr>
<tr>
<td>PoITS</td>
<td>17.323</td>
<td>6.670</td>
<td>31</td>
</tr>
</tbody>
</table>

Table H.4
Multivariate tests

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITSKILLS</td>
<td>Pillai’s Trace</td>
<td>0.605</td>
<td>22.226</td>
<td>2</td>
<td>0.000</td>
<td>0.605</td>
</tr>
<tr>
<td>Wilks’ Lambda</td>
<td>0.395</td>
<td>22.226</td>
<td>2</td>
<td>0.000</td>
<td>0.605</td>
<td></td>
</tr>
<tr>
<td>Hotelling’s Trace</td>
<td>1.533</td>
<td>22.226</td>
<td>2</td>
<td>0.000</td>
<td>0.605</td>
<td></td>
</tr>
<tr>
<td>Roy’s Largest Root</td>
<td>1.533</td>
<td>22.226</td>
<td>2</td>
<td>0.000</td>
<td>0.605</td>
<td></td>
</tr>
</tbody>
</table>

a Computed using alpha = .05
b Exact statistic
c Design: Intercept Within Subjects Design: ITS Borderline

Measure: MEASURE_1

Table H.5
Mauchly’s test of sphericity

<table>
<thead>
<tr>
<th>Effect</th>
<th>Within Subjects</th>
<th>Approx. Mauchly’s W</th>
<th>Epsilon Approx.</th>
<th>Greenhouse-Geisser</th>
<th>Huynh-Feldt</th>
<th>Lower-bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITSKILLS</td>
<td>0.977</td>
<td>0.668</td>
<td>2.000 0.716</td>
<td>0.978</td>
<td>1.000</td>
<td>0.500</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.
a May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.
b Design: Intercept Within Subjects Design: ITS Borderline
Measure: MEASURE_1

Table H.6

Tests of within-subjects effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITSKILLS</td>
<td>Sphericity Assumed</td>
<td>919.118</td>
<td>2</td>
<td>459.56</td>
<td>19.525</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>919.118</td>
<td>1.96</td>
<td>470.02</td>
<td>19.525</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>919.118</td>
<td>2</td>
<td>459.56</td>
<td>19.525</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>919.118</td>
<td>1</td>
<td>919.12</td>
<td>19.525</td>
<td>0.000</td>
</tr>
<tr>
<td>Error(ITSKILLS)</td>
<td>Sphericity Assumed</td>
<td>1412.215</td>
<td>60</td>
<td>23.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>1412.215</td>
<td>58.66</td>
<td>24.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>1412.215</td>
<td>60</td>
<td>23.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>1412.215</td>
<td>30</td>
<td>47.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Computed using alpha = .05

Measure: MEASURE_1

Table H.7

Tests of within-subjects contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>FREQUENC Type III Sum of df Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITSKILLS</td>
<td>Linear</td>
<td>171.11</td>
<td>1</td>
<td>171.113</td>
<td>6.620</td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>748.01</td>
<td>1</td>
<td>748.005</td>
<td>35.237</td>
</tr>
<tr>
<td>Error(ITSKILLS)</td>
<td>Linear</td>
<td>775.39</td>
<td>30</td>
<td>25.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>636.83</td>
<td>30</td>
<td>21.23</td>
<td></td>
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</tbody>
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Measure: MEASURE_1

Transformed Variable: Average

Table H.8

Tests of between-subjects effects

<table>
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<tr>
<th>Source</th>
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<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>29026.333</td>
<td>1</td>
<td>29026.333</td>
<td>181.971</td>
<td>0.000</td>
</tr>
<tr>
<td>Error</td>
<td>4785.333</td>
<td>30</td>
<td>159.511</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX I: Teachers’ Self-efficacy in Using ICT in Teaching

### Table I.1

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Pre-SE</th>
<th>Mid-SE</th>
<th>Post-SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>30.68</td>
<td>39.06</td>
<td>35.55</td>
</tr>
<tr>
<td>Std. Error of Mean</td>
<td>1.26</td>
<td>1.23</td>
<td>1.35</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>7.03</td>
<td>6.84</td>
<td>7.52</td>
</tr>
<tr>
<td>Variance</td>
<td>49.43</td>
<td>46.73</td>
<td>56.52</td>
</tr>
</tbody>
</table>

Measure: MEASURE_1

### Table I.2

#### Within-subjects factors

<table>
<thead>
<tr>
<th>SE</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-SE</td>
</tr>
<tr>
<td>2</td>
<td>Mid-SE</td>
</tr>
<tr>
<td>3</td>
<td>Post-SE</td>
</tr>
</tbody>
</table>

### Table I.3

#### Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-SE</td>
<td>30.68</td>
<td>7.03</td>
<td>31</td>
</tr>
<tr>
<td>Mid-SE</td>
<td>39.06</td>
<td>6.84</td>
<td>31</td>
</tr>
<tr>
<td>Post-SE</td>
<td>35.55</td>
<td>7.52</td>
<td>31</td>
</tr>
</tbody>
</table>

### Table I.4

#### Multivariate tests

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>Pillai’s Trace</td>
<td>.639</td>
<td>25.620b</td>
<td>2</td>
<td>29</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Wilks’ Lambda</td>
<td>.361</td>
<td>25.620b</td>
<td>2</td>
<td>29</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Hotelling’s Trace</td>
<td>1.767</td>
<td>25.620b</td>
<td>2</td>
<td>29</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Roy’s Largest Root</td>
<td>1.767</td>
<td>25.620b</td>
<td>2</td>
<td>29</td>
<td>0.000</td>
</tr>
</tbody>
</table>

a Computed using alpha = .05  
b Exact statistic  
c Design: Intercept Within Subjects Design: ITSKILLS

### Table I.5

#### Mauchly’s test of sphericity

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Mauchly’s Approx. Chi-Square df</th>
<th>Sig. r</th>
<th>Greenhouse-Geisse Epsilon</th>
<th>Huynh-Feld Epsilon</th>
<th>Lower-bounding Epsilon</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>.830</td>
<td>5.408</td>
<td>2.000.067</td>
<td>.855</td>
<td>.901</td>
</tr>
</tbody>
</table>

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.  
a May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.  
b Design: Intercept Within Subjects Design: ITSKILLS
Measure: MEASURE_1

Table I.6

*Tests of within-subjects effects*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>Sphericity Assumed</td>
<td>1099.806</td>
<td>2</td>
<td>549.903</td>
<td>22.710</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>1099.806</td>
<td>1.709</td>
<td>643.461</td>
<td>22.710</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>1099.806</td>
<td>1.802</td>
<td>610.262</td>
<td>22.710</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>1099.806</td>
<td>1.000</td>
<td>1099.806</td>
<td>22.710</td>
<td>.000</td>
</tr>
<tr>
<td>Error(SE)</td>
<td>Sphericity Assumed</td>
<td>1452.860</td>
<td>60</td>
<td>24.214</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greenhouse-Geisser</td>
<td>1452.860</td>
<td>51.276</td>
<td>28.334</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Huynh-Feldt</td>
<td>1452.860</td>
<td>54.066</td>
<td>26.872</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower-bound</td>
<td>1452.860</td>
<td>30.000</td>
<td>48.429</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Computed using alpha = .05

Measure: MEASURE_1

Table I.7

*Tests of within-subjects contrasts*

<table>
<thead>
<tr>
<th>Source</th>
<th>FREQUENC</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>Linear</td>
<td>367.758</td>
<td>1</td>
<td>367.758</td>
<td>11.025</td>
<td>.002</td>
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<tr>
<td></td>
<td>Quadratic</td>
<td>732.048</td>
<td>1</td>
<td>732.048</td>
<td>48.575</td>
<td>.000</td>
</tr>
<tr>
<td>Error(SE)</td>
<td>Linear</td>
<td>1000.742</td>
<td>30</td>
<td>33.358</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>452.118</td>
<td>30</td>
<td>15.071</td>
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<td></td>
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</table>

Measure: MEASURE_1

Transformed Variable: Average

Table I.8

*Tests of between-subjects effects*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>114555.871</td>
<td>1</td>
<td>114555.871</td>
<td>1098.870</td>
<td>.000</td>
</tr>
<tr>
<td>Error</td>
<td>3127.462</td>
<td>30</td>
<td>104.249</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX J: Teachers’ Number of Strategies, Periods and Weeks incorporating ICT in Teaching

Table J.1
Number of strategies incorporating ICT in teaching per teacher per week

<table>
<thead>
<tr>
<th></th>
<th>St1</th>
<th>St2</th>
<th>St1PWk1</th>
<th>St2PW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Minimum</td>
<td>4</td>
<td>6</td>
<td>0.16</td>
<td>0.19</td>
</tr>
<tr>
<td>Maximum</td>
<td>115</td>
<td>211</td>
<td>4.6</td>
<td>6.59</td>
</tr>
<tr>
<td>Sum</td>
<td>1142</td>
<td>1847</td>
<td>45.68</td>
<td>57.72</td>
</tr>
<tr>
<td>Mean</td>
<td>36.84</td>
<td>59.58</td>
<td>1.4735</td>
<td>1.8619</td>
</tr>
<tr>
<td>Std. Error</td>
<td>5.29</td>
<td>7.72</td>
<td>0.2115</td>
<td>0.2411</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>29.44</td>
<td>42.96</td>
<td>1.1777</td>
<td>1.3425</td>
</tr>
<tr>
<td>Variance</td>
<td>866.873</td>
<td>1845.518</td>
<td>1.387</td>
<td>1.802</td>
</tr>
</tbody>
</table>

Table J.2
Numbers, means and proportion of periods incorporating ICT in teaching per teacher per week

<table>
<thead>
<tr>
<th></th>
<th>Per1</th>
<th>Per2</th>
<th>Per1PWk1</th>
<th>Per2PW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Minimum</td>
<td>1</td>
<td>3</td>
<td>0.04</td>
<td>0.09</td>
</tr>
<tr>
<td>Maximum</td>
<td>24</td>
<td>70</td>
<td>0.96</td>
<td>2.19</td>
</tr>
<tr>
<td>Sum</td>
<td>297</td>
<td>915</td>
<td>11.88</td>
<td>28.59</td>
</tr>
<tr>
<td>Mean</td>
<td>9.58</td>
<td>29.52</td>
<td>0.3832</td>
<td>0.9224</td>
</tr>
<tr>
<td>Std. Error</td>
<td>1.14</td>
<td>3.18</td>
<td>0.0457</td>
<td>0.0993</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>6.36</td>
<td>17.68</td>
<td>0.2544</td>
<td>0.5526</td>
</tr>
<tr>
<td>Variance</td>
<td>40.452</td>
<td>312.725</td>
<td>0.0647</td>
<td>0.305</td>
</tr>
</tbody>
</table>

Table J.3
Numbers, means of weeks incorporating ICT in teaching per teacher per week

<table>
<thead>
<tr>
<th></th>
<th>#Week1</th>
<th>#Week2</th>
<th>#WeekPWk1</th>
<th>WK2PW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Minimum</td>
<td>1</td>
<td>2</td>
<td>0.04</td>
<td>0.06</td>
</tr>
<tr>
<td>Maximum</td>
<td>20</td>
<td>30</td>
<td>0.8</td>
<td>0.94</td>
</tr>
<tr>
<td>Sum</td>
<td>194</td>
<td>483</td>
<td>7.76</td>
<td>15.09</td>
</tr>
<tr>
<td>Mean</td>
<td>6.26</td>
<td>15.58</td>
<td>0.250</td>
<td>0.487</td>
</tr>
<tr>
<td>Std. Error</td>
<td>0.73</td>
<td>1.17</td>
<td>0.029</td>
<td>0.037</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>4.06</td>
<td>6.53</td>
<td>0.162</td>
<td>0.204</td>
</tr>
<tr>
<td>Variance</td>
<td>16.465</td>
<td>42.59</td>
<td>0.026</td>
<td>0.042</td>
</tr>
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</table>
Table J.4
Sums, averages per teacher, and averages per teacher per week of strategies, periods and weeks

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strategy</td>
<td>Period</td>
</tr>
<tr>
<td>Sum</td>
<td>1142</td>
<td>297</td>
</tr>
<tr>
<td>per teacher</td>
<td>36.84</td>
<td>9.58</td>
</tr>
<tr>
<td>per week</td>
<td>1.474</td>
<td>0.383</td>
</tr>
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</table>

Table J.5
Proportion of periods used with IT in teaching compared with maximum periods available

<table>
<thead>
<tr>
<th>Description</th>
<th>00-01</th>
<th>01-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teachers in school</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Periods/Teacher/Week</td>
<td>31.15</td>
<td>28.76</td>
</tr>
<tr>
<td>Total No. of Periods/Week</td>
<td>1246</td>
<td>1150.4</td>
</tr>
<tr>
<td>No. of Periods of Computer Room &amp; MMLC for C.L./Week</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>No. of Periods of Computer Room &amp; MMLC for Library/Week</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Total No. of Periods of Computer room &amp; MMLC used/Week</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>Total # Periods available in Computer Room &amp; MMLC</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>Total # Periods available to teachers after C.L. &amp; library classes</td>
<td>48</td>
<td>49</td>
</tr>
<tr>
<td>Maximum % of Periods in Computer Room &amp; MMLC for teachers’ use</td>
<td>3.85%</td>
<td>4.26%</td>
</tr>
<tr>
<td>Total No. of Periods used ICT in teaching/Teacher/Week</td>
<td>0.3464</td>
<td>1.0512</td>
</tr>
<tr>
<td>% of Periods used ICT compared with teaching load/teacher/week</td>
<td>1.11%</td>
<td>3.66%</td>
</tr>
<tr>
<td>Proportion % of periods with ICT to Max % Periods</td>
<td>28.87%</td>
<td>85.81%</td>
</tr>
</tbody>
</table>

Table J.6
Numbers of strategies per week in 2000-01 and 2001-02 and percentages

Page: 354
<table>
<thead>
<tr>
<th>Strategy</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sum</td>
<td>192</td>
<td>113</td>
<td>185</td>
<td>161</td>
<td>18</td>
<td>164</td>
</tr>
<tr>
<td>2000</td>
<td>per teacher</td>
<td>6.194</td>
<td>3.645</td>
<td>5.968</td>
<td>5.194</td>
<td>0.581</td>
<td>5.290</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.248</td>
<td>0.146</td>
<td>0.239</td>
<td>0.208</td>
<td>0.023</td>
<td>0.212</td>
</tr>
<tr>
<td>2001</td>
<td>Sum/Total</td>
<td>16.81%</td>
<td>9.89%</td>
<td>16.20%</td>
<td>14.10%</td>
<td>1.58%</td>
<td>14.36%</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>155</td>
<td>70</td>
<td>186</td>
<td>271</td>
<td>319</td>
<td>234</td>
</tr>
<tr>
<td>2001</td>
<td>per teacher</td>
<td>5.000</td>
<td>2.258</td>
<td>6.000</td>
<td>8.742</td>
<td>10.290</td>
<td>7.548</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.200</td>
<td>0.090</td>
<td>0.240</td>
<td>0.350</td>
<td>0.412</td>
<td>0.302</td>
</tr>
<tr>
<td>2002</td>
<td>Sum/Total</td>
<td>8.39%</td>
<td>3.79%</td>
<td>10.07%</td>
<td>14.67%</td>
<td>17.27%</td>
<td>12.67%</td>
</tr>
<tr>
<td>Strategy</td>
<td>S8</td>
<td>S9</td>
<td>S10</td>
<td>S11</td>
<td>S12</td>
<td>S13</td>
<td>S14</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>10</td>
<td>24</td>
<td>42</td>
<td>64</td>
<td>34</td>
<td>10</td>
</tr>
<tr>
<td>2000</td>
<td>per teacher</td>
<td>0.323</td>
<td>0.774</td>
<td>1.355</td>
<td>2.065</td>
<td>1.097</td>
<td>0.323</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.013</td>
<td>0.031</td>
<td>0.054</td>
<td>0.083</td>
<td>0.044</td>
<td>0.013</td>
</tr>
<tr>
<td>2001</td>
<td>Sum/Total</td>
<td>0.88%</td>
<td>2.10%</td>
<td>3.68%</td>
<td>5.60%</td>
<td>2.98%</td>
<td>0.88%</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>17</td>
<td>16</td>
<td>40</td>
<td>63</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>2001</td>
<td>per teacher</td>
<td>0.548</td>
<td>0.516</td>
<td>1.290</td>
<td>2.032</td>
<td>0.935</td>
<td>0.548</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.022</td>
<td>0.021</td>
<td>0.052</td>
<td>0.081</td>
<td>0.037</td>
<td>0.022</td>
</tr>
<tr>
<td>2002</td>
<td>Sum/Total</td>
<td>0.92%</td>
<td>0.87%</td>
<td>2.17%</td>
<td>3.41%</td>
<td>1.57%</td>
<td>0.92%</td>
</tr>
<tr>
<td>Strategy</td>
<td>S15</td>
<td>S16</td>
<td>S17</td>
<td>S18</td>
<td>S19</td>
<td>S20</td>
<td>S21</td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>32</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>per teacher</td>
<td>1.032</td>
<td>0.258</td>
<td>0.161</td>
<td>0.065</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.041</td>
<td>0.010</td>
<td>0.006</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Sum/Total</td>
<td>2.80%</td>
<td>0.70%</td>
<td>0.44%</td>
<td>0.18%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>37</td>
<td>79</td>
<td>14</td>
<td>3</td>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>2001</td>
<td>per teacher</td>
<td>1.194</td>
<td>2.548</td>
<td>0.452</td>
<td>0.097</td>
<td>0.194</td>
<td>4.839</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.048</td>
<td>0.102</td>
<td>0.018</td>
<td>0.004</td>
<td>0.008</td>
<td>0.194</td>
</tr>
<tr>
<td>2002</td>
<td>Sum/Total</td>
<td>2.80%</td>
<td>4.38%</td>
<td>0.76%</td>
<td>0.16%</td>
<td>0.32%</td>
<td>8.12%</td>
</tr>
<tr>
<td>Strategy</td>
<td>S22</td>
<td>S23</td>
<td>S24</td>
<td>S25</td>
<td>Sum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>1142</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>per teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Sum/Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>1847</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>per teacher</td>
<td>0.065</td>
<td>0.065</td>
<td>0.194</td>
<td>0.032</td>
<td>59.581</td>
<td></td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td>0.003</td>
<td>0.003</td>
<td>0.008</td>
<td>0.001</td>
<td>2.383</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>Sum/Total</td>
<td>0.11%</td>
<td>0.11%</td>
<td>0.32%</td>
<td>0.05%</td>
<td>100.00%</td>
<td></td>
</tr>
</tbody>
</table>

Table J.7
Legends of strategies
Table J.8.
Accumulated distribution of strategies and periods Incorporating IT in teaching (31 Teachers)

<table>
<thead>
<tr>
<th>Values</th>
<th>Strategies</th>
<th>2000-01</th>
<th>2001-02</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=5</td>
<td>1</td>
<td>0</td>
<td>9</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>&lt;=10</td>
<td>5</td>
<td>2</td>
<td>21</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>&lt;=20</td>
<td>11</td>
<td>4</td>
<td>27</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>&lt;=30</td>
<td>16</td>
<td>9</td>
<td>31</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>&lt;=40</td>
<td>20</td>
<td>11</td>
<td>31</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>&lt;=50</td>
<td>25</td>
<td>15</td>
<td>31</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>&lt;=60</td>
<td>26</td>
<td>21</td>
<td>31</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>&lt;=70</td>
<td>27</td>
<td>22</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>&lt;=80</td>
<td>28</td>
<td>23</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>&lt;=90</td>
<td>28</td>
<td>25</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>&lt;=100</td>
<td>28</td>
<td>25</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Over 100</td>
<td>3</td>
<td>6</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>36.84</td>
<td>59.58</td>
<td>9.58</td>
<td>29.65</td>
<td></td>
</tr>
</tbody>
</table>

Table J.9.
Distribution and percentages of strategies and periods incorporating IT in teaching (31 Teachers)

<table>
<thead>
<tr>
<th>Strategies</th>
<th>2000-01</th>
<th>2001-02</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>1</td>
<td>3.23%</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>6-10</td>
<td>4</td>
<td>12.90%</td>
<td>2</td>
<td>6.45%</td>
</tr>
<tr>
<td>11-20</td>
<td>6</td>
<td>19.35%</td>
<td>2</td>
<td>6.45%</td>
</tr>
<tr>
<td>21-30</td>
<td>5</td>
<td>16.13%</td>
<td>5</td>
<td>16.13%</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
<td>12.90%</td>
<td>2</td>
<td>6.45%</td>
</tr>
<tr>
<td>41-40</td>
<td>5</td>
<td>16.13%</td>
<td>4</td>
<td>12.90%</td>
</tr>
<tr>
<td>Range</td>
<td>Count</td>
<td>Percentage</td>
<td>Total</td>
<td>Percentage</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>51-60</td>
<td>1</td>
<td>3.23%</td>
<td>6</td>
<td>19.35%</td>
</tr>
<tr>
<td>61-70</td>
<td>1</td>
<td>3.23%</td>
<td>1</td>
<td>3.23%</td>
</tr>
<tr>
<td>71-80</td>
<td>1</td>
<td>3.23%</td>
<td>1</td>
<td>3.23%</td>
</tr>
<tr>
<td>81-90</td>
<td>0</td>
<td>0%</td>
<td>2</td>
<td>6.45%</td>
</tr>
<tr>
<td>91-100</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Over 100</td>
<td>3</td>
<td>9.68%</td>
<td>6</td>
<td>19.35%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>
Table J.10.

Number of strategies used in each subject in the two years (all teachers).

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Incorporated ICT in Teaching</th>
<th>2000-01</th>
<th>2001-02</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art</td>
<td>144</td>
<td>107</td>
<td></td>
<td>-25.69%</td>
</tr>
<tr>
<td>Bible Study</td>
<td>81</td>
<td>60</td>
<td></td>
<td>-25.93%</td>
</tr>
<tr>
<td>Chinese</td>
<td>289</td>
<td>478</td>
<td></td>
<td>65.40%</td>
</tr>
<tr>
<td>Computer</td>
<td>723</td>
<td>591</td>
<td></td>
<td>-18.26%</td>
</tr>
<tr>
<td>English</td>
<td>262</td>
<td>635</td>
<td></td>
<td>142.37%</td>
</tr>
<tr>
<td>General Study</td>
<td>187</td>
<td>390</td>
<td></td>
<td>108.56%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214</td>
<td>299</td>
<td></td>
<td>39.72%</td>
</tr>
<tr>
<td>Physical Education</td>
<td>53</td>
<td>20</td>
<td></td>
<td>-62.26%</td>
</tr>
<tr>
<td>Putonghua</td>
<td>17</td>
<td>79</td>
<td></td>
<td>364.71%</td>
</tr>
<tr>
<td>Tutorial</td>
<td>8</td>
<td>31</td>
<td></td>
<td>287.50%</td>
</tr>
<tr>
<td>Music</td>
<td>44</td>
<td>82</td>
<td></td>
<td>86.36%</td>
</tr>
<tr>
<td>Meeting/Activities</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2022</td>
<td>2780</td>
<td></td>
<td>37.49%</td>
</tr>
<tr>
<td>Total (Less Strategies used in Computer)</td>
<td>1299</td>
<td>2189</td>
<td>68.51%</td>
<td></td>
</tr>
</tbody>
</table>

Table J.11

Percentage of periods incorporating IT in teaching by each teacher in the school to the total number of periods (827) in 32 weeks in 2001-2002.

<table>
<thead>
<tr>
<th>No. Periods</th>
<th>Percentage</th>
<th>No. Periods</th>
<th>Percentage</th>
<th>No. Periods</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>16.20%</td>
<td>62</td>
<td>5.70%</td>
<td>25</td>
<td>3.55%</td>
</tr>
<tr>
<td>124</td>
<td>14.90%</td>
<td>54</td>
<td>5.44%</td>
<td>29</td>
<td>3.36%</td>
</tr>
<tr>
<td>93</td>
<td>11.18%</td>
<td>53</td>
<td>5.34%</td>
<td>28</td>
<td>3.24%</td>
</tr>
<tr>
<td>72</td>
<td>10.71%</td>
<td>33</td>
<td>4.91%</td>
<td>28</td>
<td>3.02%</td>
</tr>
<tr>
<td>87</td>
<td>9.71%</td>
<td>36</td>
<td>4.89%</td>
<td>27</td>
<td>2.81%</td>
</tr>
<tr>
<td>74</td>
<td>9.64%</td>
<td>36</td>
<td>4.50%</td>
<td>23</td>
<td>2.76%</td>
</tr>
<tr>
<td>72</td>
<td>8.33%</td>
<td>37</td>
<td>4.28%</td>
<td>16</td>
<td>2.27%</td>
</tr>
<tr>
<td>69</td>
<td>8.29%</td>
<td>34</td>
<td>4.25%</td>
<td>18</td>
<td>1.94%</td>
</tr>
<tr>
<td>65</td>
<td>7.25%</td>
<td>31</td>
<td>4.21%</td>
<td>16</td>
<td>1.92%</td>
</tr>
<tr>
<td>67</td>
<td>7.22%</td>
<td>39</td>
<td>4.06%</td>
<td>13</td>
<td>1.50%</td>
</tr>
<tr>
<td>64</td>
<td>7.14%</td>
<td>39</td>
<td>4.06%</td>
<td>7</td>
<td>0.75%</td>
</tr>
<tr>
<td>56</td>
<td>6.25%</td>
<td>33</td>
<td>3.97%</td>
<td>3</td>
<td>0.28%</td>
</tr>
<tr>
<td>56</td>
<td>6.03%</td>
<td>20</td>
<td>3.91%</td>
<td>2</td>
<td>0.18%</td>
</tr>
<tr>
<td>58</td>
<td>5.85%</td>
<td>31</td>
<td>3.73%</td>
<td></td>
<td>Average 5.28%</td>
</tr>
</tbody>
</table>
APPENDIX K: BASIC Level of IT Competence

XXXXX 小學 (XXXXX Primary School)

個人教學概覽 (Personal Teaching Portfolio) 初級程度要求
(Requirements for Basic Level)

1. 設計一個教授一或以上課堂的教案，其中包括 (Design a lesson plan to teach one or more lessons, which include)
   a. 爲何該課使用資訊科技教學 (50 字或以上) (Why use IT in the teaching of that lesson (50 or more Chinese characters))
   b. 課後反思 (教學成效、有何改善等) (100 字或以上) (Reflection after class (Effectiveness in teaching and learning? How to improve?) (100 or more words)

2. 設計一份在該課堂運用的投影片簡報 (五張或以上)，該簡報能運用 (Design a Microsoft PowerPoint® presentation file to be used in that lesson (5 or more slides). The presentation file should use)
   c. 超連結 (Hyperlink)
   d. 圖像 (Graphics)
   e. 音效 (Audio)
   f. 動畫模式 (例如：從右飛入，過場效果等) (Animation mode (e.g. Fly in from right, transition effects, etc.)

3. 以電郵告知校長已備妥個人教學概覽 (以附件形式提交工作計劃也可) (Use email to inform the principal that the portfolio assessment tasks are ready (The portfolio assessment tasks can be submitted as an attachment)

4. 填妥教師自我評核表格 (Duly filled Teacher’s Self-Evaluation Form)

5. 撰文一篇，概述資訊科技教育的性質、用途和所發揮的作用 (50 字或以上) (Write concisely in simple terms the nature, use and roles of IT in education (50 or more words).)
Basic Level

Objectives:
The “Suggested Portfolio Assessment Checklist” is designed for the teacher professional development in IT in education. The purpose of this checklist is twofold:

To assist teachers to identify their current level of IT in Education competency; and

To assist trainers to assess the level of competency of their trainees.

It is suggested that this assessment checklist be applied to other teachers who want to identify their current level of IT in Education competency, but not participate in any training programs.

Suggested Portfolio Assessment Tasks:

- Present a scheme of work which consists of the following:
  - Lesson plans that need word processed, consists of a slide show, Web materials to be downloaded from the Internet as reference link, and the use of at least one readily available educational courseware and
  - Rationale for using IT in the lessons: apply what and how to apply.
  - A reflective statement of how they have used IT in their duties as teachers.
  - E-mail the portfolio to the principal or to notify the principal via e-mail that the portfolio is ready with the lesson plans as an attachment.
  - Self-assessment form completed by the teacher.
**SELF-ASSESSMENT FORM:**

**SCHEME OF WORK**

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

- Prepare lesson plans to reflect the understanding of the appropriate use of slide show, Web materials, and educational courseware in teaching context.
- A reflective statement of how the trainees have used IT in their works as teachers.
- A short essay with rationale on the use of IT in the lessons.

**OPERATING A MICROCOMPUTER**

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

- Be able to operate a range of peripherals to fulfil teaching tasks:
  - Printer;
  - Keyboard;
  - Modem;
  - Scanner; and
  - Mouse.
- Be able to use appropriate terminology to describe the basic components of a computer system
- Be able to start up and shut down PC via menu bar.
- Be able to perform basic operations on Windows environment. The trainees should able to:
  - Maximize and minimize a window;
  - Pull-down and expanded pull-down menus;
  - Select, open, move, and close a window;
  - Resize a window, tile and cascade windows;
  - Scroll within a window;
  - Copy documents from hard disk to floppy disk and vice versa;
Create and name/ rename a folder;  
Open and place documents inside a folder; and  
Switch on and select different Chinese character input methods.  

<table>
<thead>
<tr>
<th>WORD PROCESSING I</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to produce the lesson plans in hard and soft copies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to produce the reflective statement in hard and soft copies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The lesson plans and reflective statement have to be properly formatted and satisfy the following elements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grammar and spelling checks conducted;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Chinese characters vertically (直書); and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate margins and line spacing.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to produce at least one simple slide show in hard and soft copies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The slide shows have to be properly formatted and satisfy the following elements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organize in a logical sequence; and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment of animations, graphics and sounds.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEB BROWSING AND E-MAIL OPERATION</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to download Web materials from the Internet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to use bookmark to link to the related sites.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to print out Web pages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to seek a specific Web site by entering the appropriate URL and through the search engine.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Be able to notify the principal via e-mail with attachment.

<table>
<thead>
<tr>
<th><strong>EDUCATIONAL SOFTWARE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
</tr>
<tr>
<td>Yes / No</td>
</tr>
<tr>
<td>Be able to execute an educational software and to identify the basic features of the software.</td>
</tr>
<tr>
<td>Understanding of the merits and shortcomings of the use of educational software on learning and teaching.</td>
</tr>
<tr>
<td>Be able to deliver lessons using appropriate educational software specific to the teacher’s own subject areas.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>A FRAMEWORK OF USING IT IN EDUCATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
</tr>
<tr>
<td>Yes / No</td>
</tr>
<tr>
<td>Have the understanding of the following issues in using IT in learning and teaching.</td>
</tr>
<tr>
<td>Infusing IT into the curriculum;</td>
</tr>
<tr>
<td>Activity-based approaches and IT;</td>
</tr>
<tr>
<td>Project-based approaches and IT; and</td>
</tr>
<tr>
<td>Some examples of equity, legal, ethical and social issues.</td>
</tr>
</tbody>
</table>
APPENDIX L: Intermediate Level of IT Competence

XXXXX 小學 (XXXXX Primary School)

個人教學概覽 (Personal Teaching Portfolio) 中級程度要求
(Requirements for Intermediate Level)

1. 設計一個教授一或以上課堂的教案，其中包括 (Design a lesson plan to teach one or more lessons, which include)
   a. 爲何該課使用資訊科技教學 (100 字或以上) (Why use IT in the teaching of that lesson (100 or more Chinese characters))
   b. 課後反思 (教學成效，有何改善等) (100 字或以上) (Reflection after class (Effectiveness in teaching and learning? How to improve?) (100or more words)

2. 設計一份在該課堂運用的投影片簡報 (五張或以上)，該簡報能運用 (Design a Microsoft PowerPoint® presentation file to be used in that lesson (5 or more slides). The presentation file should use
   a. 超連結 (Hyperlinks)
   b. 圖像 (Graphics)
   c. 錄像片段 (可取自 VCD、錄影帶等) (Video Clip (Can be taken from VCD, video tape, etc.)
   d. 音效 (Audio)
   e. 動作鍵 (Action Buttons)
   f. 文字效果 (例如: 颜色、大小、文字藝術師等) (Text Effects (e.g. Colour, Size, Text Artist, etc.)
   g. 動畫模式 (例如: 從右飛入、過場效果等) (Animation mode (e.g. Fly in from right, transition effects, etc.))

3. 設計一個網頁 (三頁或以上)，其內容為 (Design a website (3 or more pages). The content include
   a. (A)個人網頁和班會網頁或 (B)教授某一課題的網頁 ((A) Personal website and website of the class or (B) Website for teaching a certain topic)
   b. 互相連結和包含不少於十個圖像 (Interlinked and contains not less than 10 graphics)

4. 製作一個資料庫或試算表，以計算某一班學生的測驗成績平均分及排名 (Develop a database or spreadsheet used to calculate the average of the marks of students of a certain class in a test and rank the students in order or marks)

5. 由 FTP 網站下载兩個或以上檔案，並將其存於磁碟中 (Download tow or more files from a FTP site and save them in a disk drive)

6. 參與學校內／外的新聞組／討論組，並將某一次討論內容列印在紙上 (Participate in a newsgroup/discussion group inside/outside the school, and print the content of a discussion session on paper)

7. 選擇一個與小學科目有關的現有教育軟件，撰文一篇 (不少於 100 字)，說明如何運用該軟件配合教學，並指出該軟件的優缺點 (Select an
existing educational software relevant to a primary school subject, write a paper (in not less than 100 words) illustrating how to use the software to support teaching, and point out the strength and shortcomings of the software.

8. 填妥教師自我評核表格 (Duly checked Self-Assessment Form)

9. 撰文一篇 (不少於 200 字) ，討論在教學中使用資訊科技的情況，包括在不同情況下，可以使用甚麼不同的軟硬件以作配合，及如何使用該等軟硬件，以達到不同的教學目的，並檢討如何及跟進該等教學 (Write a paper (not less than 200 words) to discuss the application of IT in teaching in different situations, what kinds of hardware and software should be coordinated so that these hardware and software can meet different teaching and learning objectives, reflect and follow up that teaching and learning practice.)
Intermediate Level

Objectives:

The “Suggested Portfolio Assessment Checklist” is designed for the teacher professional development in IT in education. The purpose of this checklist is twofold:

To assist teachers to identify their current level of IT in Education competency; and

To assist trainers to assess the level of competency of their trainees.

It is suggested that this assessment checklist be applied to other teachers who want to identify their current level of IT in Education competency, but not participate in any training programs.

Suggested Portfolio Assessment Tasks:

Present a scheme of work which consists of the following:

- Lesson plans that need word processed, consists of a slide show incorporating and a simple video segment and Web materials to be uploaded to a Web site; some freehand drawing using any graphics package;
- Written report of an evaluation of a courseware; and
- Rationale for using IT in the lessons: apply what and how to apply Internet technology in teaching and learning.
- A reflective statement of how they have used IT in their duties as teachers.
- Self-assessment form completed by the teacher.

The portfolio should also contain:

- a few Web pages designed by the teacher, these pages should be interlinked and contain some graphics;
- evidence that the teacher has joined/participates in some discussion groups and ICQ;
- the downloading of at least two files from a remote ftp site;
- a simple database and/or spreadsheet, which contains the information of trainees’ students, (N.B. optional depending whether a teacher has taken the module).

N.B. if a teacher has taken the Chinese Character Input modules, then at least one of the artefacts above needs to demonstrate the knowledge of Chinese Character input.
**SELF-ASSESSMENT FORM:**

**SCHEME OF WORK**

| Completed
<table>
<thead>
<tr>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson plans with rationale to reflect the understanding of the appropriate use of slide show, video segment, Web materials, and some freehand drawing using any graphics package.</td>
</tr>
<tr>
<td>A reflective statement of how the trainees have used IT in their duties as teachers.</td>
</tr>
<tr>
<td>A written report of an evaluation of a educational courseware.</td>
</tr>
</tbody>
</table>

**WORD PROCESSING II**

| Completed
<table>
<thead>
<tr>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to design and produce a test paper, which contains essay questions, fill-in blanks and multiple-choice items.</td>
</tr>
<tr>
<td>Be able to design and produce a document with the use of columns and graphics</td>
</tr>
</tbody>
</table>

**PRESENTATION SOFTWARE II**

| Completed
<table>
<thead>
<tr>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to design and produce a teaching package using presentation software. The package must demonstrate the appropriate use of the following elements.</td>
</tr>
<tr>
<td>Hyperlinks;</td>
</tr>
<tr>
<td>Graphics;</td>
</tr>
<tr>
<td>Video;</td>
</tr>
<tr>
<td>Sound;</td>
</tr>
<tr>
<td>Action buttons;</td>
</tr>
<tr>
<td>Text effects; and</td>
</tr>
<tr>
<td>Other components in animation mode.</td>
</tr>
</tbody>
</table>
### Multimedia Production I

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

**Be able to draw simple freehand figures appropriate to the context of a lesson.**

**Be able to capture and edit clipart graphics and pictures for use in presentation and teaching notes.**

**Be able to capture a segment of video tape as an AVI file.**

**Be able to modify some existing presentations by inserting the multimedia objects for the use in trainees’ classrooms.**

### Web Page Design I

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

**Be able to capture an educational Web page and save on a local disk.**

**Be able to design and produce a simple personal Web page that is interlinked with class Web page and contain some graphics.**

**Be able to design and produce class Web pages with appropriate linkages to the trainee’s personal Web page.**

### Internet / Intranet Applications

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

**Be able to join a newsgroup/discussion group.**

**Be able to download, install, and operate ICQ.**

**Be able to download and transfer at least two files from/to remote ftp site.**

### Courseware Evaluation

<table>
<thead>
<tr>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes / No</td>
</tr>
</tbody>
</table>

**Be able to design and produce a checklist for evaluating a courseware according to various educational theories.**

**Be able to produce a written report on an evaluation of a courseware for a school subject using the criterion approach.**
<table>
<thead>
<tr>
<th><strong>CHINESE CHARACTER INPUT (OPTIONAL)</strong></th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to produce a teaching material using any Chinese inputs (including handwritten pad)</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DATABASE I (OPTIONAL)</strong></th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to design and create a simple database which contains the information of the trainees’ students.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Be able to perform some queries to achieve the desired information in a database (including sorting records).</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Be able to create a database layout/report with headers and footers.</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SPREADSHEET OPERATION I (OPTIONAL)</strong></th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to design and create a simple spreadsheet which presents data such as text and numeric in an appropriate format.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Be able to design and produce a spreadsheet which demonstrates the appropriate use of formulas and built-in functions such as sum, average, maximum, minimum, sorting and filtering.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Report with headers and footers.</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SPREADSHEET OPERATION I (OPTIONAL)</strong></th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to design and create a simple spreadsheet which presents data such as text and numeric in an appropriate format.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Be able to design and produce a spreadsheet which demonstrates the appropriate use of formulas and built-in functions such as sum, average, maximum, minimum, sorting and filtering.</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>
APPENDIX M: Upper Intermediate level of IT

Competence

Teacher’s Self-Assessment Form - Upper Intermediate Level

Name of Teacher: ____________
Code: _______________

Scheme of Work

<table>
<thead>
<tr>
<th>Completed (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson plans that needs multimedia learning and/or teaching materials developed by an authoring tool such as Authorware</td>
</tr>
<tr>
<td>A short essay identifying the possible change about the trainee’s personal teaching philosophy or the possible changes in the trainee’s own teaching subject due to application of IT; and the description should reflect what and how the paradigm shift is.</td>
</tr>
<tr>
<td>A reflective statement of how they have used IT in their duties as teachers.</td>
</tr>
</tbody>
</table>

Daily Operations of Computer Network

<table>
<thead>
<tr>
<th>Completed Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to perform some basic operations on the network. These include:</td>
</tr>
<tr>
<td>Connect/login and disconnect/logout;</td>
</tr>
<tr>
<td>Save files in networked drives;</td>
</tr>
<tr>
<td>Print documents through network printer; and</td>
</tr>
<tr>
<td>Assign user accounts according to the users’ priorities.</td>
</tr>
<tr>
<td>A written essay on the use of networked facilities for collaborative and project-based learning.</td>
</tr>
<tr>
<td>Be able to reinstall software such as Windows.</td>
</tr>
<tr>
<td>Be able to use appropriate terminology to describe the failure of the operation of software and hardware.</td>
</tr>
<tr>
<td>Be able attempt to resolve hardware, software and network problems.</td>
</tr>
<tr>
<td>Be able to backup from the hard disk.</td>
</tr>
</tbody>
</table>
Be able to perform regular disk scanning as a precaution for potential data lost.

Be able to perform some basic procedures to prevent virus attack, for instance, installations of virus scan.

Be able to operate an anti-virus utility to clean an infected disk.

<table>
<thead>
<tr>
<th>Integrating IT in Teaching and Learning</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the fundamental concepts on the issue of integrating IT in learning and teaching.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantages and disadvantages of the traditional teaching paradigm;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some suggestions on the improvement of the traditional teaching with the usage of IT;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advantages and disadvantages of the new teaching paradigm;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible changes due to application of IT; and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment of the constructivist’s paradigm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multimedia Production II</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to capture and edit sound file (eg. Using the sound recorder).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to capture and edit video file (eg. Using the Adobe Premiere).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to download a DV tape to a computer (eg. IEEE1394 capture card).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to render an AVI file or capture a video in a MPEG file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be able to use appropriate multimedia production skills in teaching context.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authoring Language</th>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Be able to construct an authoring piece which present several multiple choice and matching items. The software must enable the scoring of results.

Be able to construct an electronic book with hypertext and navigation features.

Be able to demonstrate the appropriate use of authoring tools in teaching context.

Web Page Design II

Be able to design and develop a Web-based teaching and learning environment (i.e. Web sites) for a teaching unit that can be used in the trainees’ schools and/or classes.

The Web sites must be able to fully illustrate the appropriate use of multimedia features such as video and sound. They could be Web pages for the students or contain interactive learning materials.

Database II

Be able to construct a learning package consisting of a database that can be used in the trainees’ schools and/or classes.

The database must enable the illustration of the appropriate use of the following elements.

<table>
<thead>
<tr>
<th>Table</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td></td>
</tr>
<tr>
<td>Queries using multiple criteria (include sorting the data into particular order)</td>
<td></td>
</tr>
<tr>
<td>Relationships between tables</td>
<td></td>
</tr>
<tr>
<td>Forms</td>
<td></td>
</tr>
<tr>
<td>Reports</td>
<td></td>
</tr>
</tbody>
</table>

Be able to design and develop a multiple-choice item bank subsumed under different topics and difficulty levels.
## Spreadsheet Operations II (Optional)

<table>
<thead>
<tr>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to construct “What-if” analysis models for learning and teaching.</td>
<td></td>
</tr>
<tr>
<td>Be able to construct a learning package consists of a spreadsheet with the appropriate use of macro that can be used in the trainees’ schools and/or classes.</td>
<td></td>
</tr>
<tr>
<td>Be able demonstrate the appropriate use of spreadsheet in the teaching context.</td>
<td></td>
</tr>
</tbody>
</table>

## Software Integration for Teaching and Learning (Optional)

<table>
<thead>
<tr>
<th>Completed</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to construct simple integrated applications that can be used in the trainees’ schools and/or classes.</td>
<td></td>
</tr>
<tr>
<td>The trainees must be able to make use of macros supplied by the trainers to produce educational integrated applications to demonstrate the understanding of the appropriate use of data sharing and hyperlink methodologies.</td>
<td></td>
</tr>
<tr>
<td>The integrated applications must be able to satisfy the following features.</td>
<td></td>
</tr>
<tr>
<td>An application developed in presentation software to deliver test questions to learners;</td>
<td></td>
</tr>
<tr>
<td>Contents of test questions will be retrieved from a data table in a word-processed document;</td>
<td></td>
</tr>
<tr>
<td>Performance of learners will be collected by a spreadsheet application; and</td>
<td></td>
</tr>
<tr>
<td>Analysed results from the spreadsheet application will be used as feedback to learner in the presentation application.</td>
<td></td>
</tr>
</tbody>
</table>