PROVISION OF CONSULTANTATION SERVICE: REVAMP OF THE TEACHERS' IT TRAINING FRAMEWORK

FINAL REPORT

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Joint Consultation Service Team
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Executive Summary

The Joint Consultation Service Team (JCST) conducted a study towards the revamp of the Information and Communication Technologies (ICT) training framework for teachers. The training framework aims to sustain teachers' professional development opportunities to advance teachers' information literacy and pedagogical integration of ICT, as well as to develop models of teacher education that will foster the establishment of teacher learning communities that will in turn generate, refine, consolidate and disseminate emerging pedagogies and professional competencies. In order to achieve these objectives, the study took the approaches including literature review, interviews, pilot courses, and open consultations.

In order to develop a global perspective and deepen our understanding of the current trend in teacher professional development pertinent to ICT in education, the JCST conducted a comprehensive literature review to examine frameworks and initiatives implemented in different countries, and to look into those well-established standards and practices in teacher ICT professional development (Part 2).

The JCST conducted eleven focus group sessions as well as seven in-depth interviews with teachers, principals, curriculum development officers, and important stakeholders to collect views about the situation of ICT use in teaching and learning, their expectation of ICT competencies for teachers, professional development opportunities to advance teachers' information literacy and pedagogical integration of ICT, and the models of professional development appropriate for teachers (Part 3).

Based on the results of the aforementioned literature review and results from the focus group discussion and interview, a proposed "Revamp of the Teachers' IT Training Framework" was developed (Part 5 & 6). Pilot professional development courses with eight modules for teachers were designed and implemented to test the proposed framework (Part 7). The evaluation results of the pilot courses were positive and constructive comments were received from the teacher practitioners in both the primary and secondary school sectors. Four open seminars (Part 4) was held to discuss the proposed framework and related implementation issues. A reflection on the feedbacks from the 339 participants of the seminars had been made. With these results and feedback, six major recommendations of this study are summarized.

First, in order to sustain the ICT professional development opportunities of teachers,

we recommend advancing teachers' ICT capability in the domains of information literacy and pedagogical integration of ICT by integrating them with their teaching activities in every possible subject area in school and beyond. The goal of this professional development activity is to ensure that teachers could facilitate and develop their students to become information literate and function in the 21st century.

Second, **we proposed a professional development framework with four dimensions, namely, technical knowledge, pedagogical integration, managing and leading ICT, and socio-cultural awareness**. This framework serves as content descriptors to identify teacher ICT professional development needs that teachers are required for successful pedagogical integration in the changing environment of digital culture, globalization and the emerging knowledge-based society. These four dimensions are used to characterize the set of ICT competences that teachers are needed to accommodate the new changes in their teaching practices.

Third, to ensure teachers to possess the capacity of employing or developing appropriate pedagogies to enhance student learning through ICT, **we recommend the teacher ICT competence espoused in the proposed framework should be stipulated as part of the desirable learning outcomes in both pre-service and in-service teacher education programmes**. We recommend that the design of professional development and learning activities should address these aspects for teachers in all school sectors, namely, pre-primary, primary and secondary.

Fourth, to effect changes in teachers' practices, **we recommend different modes of delivery of teacher professional development (TPD) programmes such as System-wide, School-based and School-clustering approaches to be employed to address the needs emerging at different stages of managing curriculum and pedagogical innovations in school**. To sustain pedagogical innovations and to properly address the issue of school and teacher diversity, it is necessary to put more emphasis and resources on promoting the formation of school clusters. The partnership among clustered schools, tertiary institutes (TEI) and other professional bodies should be strengthened. The role of TEIs and these professional bodies should migrate from being professional consultants to active participants and collaborative partners.

Fifth, in order to design system-wide professional development programmes for the success of TPD implementation, **we recommend the consideration of alignment of**

the ICT professional development with the wider curriculum reform. A genuine understanding of the ecology and dynamics of different education initiatives is pivotal to the success of TPD implementation. For instance, to void exhausting teacher's effort, some professional development programmes, such as those related to Information Literacy (IL) can be integrated with TPD for other subject or key learning areas, such as General Studies or Liberal Studies. As information collection, processing and synthesising are the essential elements required in teaching and learning of General Studies and Liberal Studies, it thus provides a rich context for the inception of information literacy.

Sixth, to foster collaboration and experience sharing among teachers and schools, **it is recommended to introduce a new 'currency' for the teachers' Continuing Professional Development (CPD).** The idea is to encourage experience teachers and school clusters, with support from professional bodies or TEIs, to provide TPD services for the school community. Their contribution should be converted into a form of 'currency' or revenue that can be injected into their schools' professional development funds or individual teachers' professional development funds. This kind of development funds can be deployed to support schools and experienced teachers to further their own professional development. This new 'currency' for CPD thus helps provide incentives for collaboration and translate teachers' expertise into capitals which can be re-invested in their own professional development.

Part 1: Introduction

1.1 Background

In 1998, the Government announced *Information Technology for Learning in a New Era: Five-year Strategy – 1998/99 to 2002/03* (Education and Manpower Bureau, 1998). The Five-year Strategy signified the Government's commitment to driving Hong Kong to become a leader, not a follower, in the information world of tomorrow. The focuses of the first strategy was to guide school principals and teachers in the integration of information technology into learning and teaching, and to develop the appropriate skills, knowledge and attitudes in learners to ensure lifelong learning (Curriculum Development Council, 2000; Education and Manpower Bureau, 1998). The existing framework of information technology (IT) training of teachers in Hong Kong with training programmes at Basic (BIT), Upper Intermediate (UIT) and Advanced (AIT) Levels, was then launched under this first Information Technology in Education (ITEd) Strategy and IT Learning Target (Curriculum Development Council, 2000; Education and Manpower Bureau, 1998).

In the new IT in Education Strategy published in July 2004, viz. *Empowering Learning and Teaching with Information Technology*, a strategic goal in *Empowering Teachers with IT* (Goal 2) was set to steer the future direction of the professional development of teachers (Education and Manpower Bureau, 2004). In the Overall Study on the Review and Evaluating of the ITEd Project conducted in 2004 , it was found that all teachers have completed IT training at the Basic Level with around 89% having reached intermediate level or above (Education and Manpower Bureau, 2005a). To take the development of ITEd forward, it was recommended in the Second Information Technology in Education Strategy "Empowering Learning and Teaching with Information Technology" (2004) that the existing teachers' IT training framework should be revamped to provide ongoing professional development for teachers in terms of pedagogical use of IT in specific subject areas, as well as its use for supporting the development of students' generic competencies in information and other higher-order cognitive skills.

With the recent development of the Information Literacy (IL) Framework for students (Education and Manpower Bureau, 2005), and the teachers' Continuing Professional Development (CPD) Framework by the Advisory Committee on Teacher Education and Qualifications (ACTEQ), the revamp should seek integration with the IL and the

CPD. It was suggested that IL should guide the revamp of training framework for teachers on ITED with its elements integrated in the framework.

1.2 Aims and Objectives

This project aims at revamping the information technology framework on the professional development of teachers. In summary, the objectives of the project include:

1. to sustain teachers' professional development opportunities to advance teachers' Information Literacy (IL) so that teachers could develop their students to become Information Literate;
2. to sustain teachers' professional development opportunities to advance pedagogical knowledge of teachers in using Information and Communication Technologies (ICT) for learning and teaching; and
3. to develop models of teacher education that will foster the establishment of teacher learning communities that will in turn generate, refine, consolidate and disseminate emerging pedagogies and professional competencies through ICT.

Part 2: Literature Review

As stated in the introduction section, the aim of the current project is two-fold: (1) to sustain teachers' professional development opportunities to advance teachers' Information Literacy (IL) and pedagogical integration of IT; and (2) to develop models of teacher education that will foster the establishment of teacher learning communities that will in turn generate, refine, consolidate and disseminate emerging pedagogies and professional competencies. In order to describe and understand the issues in connection to the project aim, a comprehensive literature review has been conducted to examine the following five related issues around the project aim.

2.1 ICT in Education and Teacher ICT Competency

The past several decades have witnessed the shift towards knowledge economy and information society at global scale. Information and Communication Technologies (ICT) have become the driving force of this trend through accelerating inter-cultural communication and information exchange. This trend has brought about transformative changes in all walks of life. Competence with ICT is imperative for many professions. For instance, ICT is increasingly becoming integral to the delivery of healthcare - from electronic patient record systems in hospitals, to geographic information systems for public health, to Internet technologies for tele-health applications (http://www.synapsehealth.com/aboutus.htm). In business world, the International Education Guideline on "IT and Accounting Curriculum" issued by IFAC, emphasized very succinctly the need of the time:

"The profession of accountancy is no longer bookkeeping or auditing or filling out of tax returns. The first and the last activity are now being performed by IT professionals and any one with business knowledge, whilst auditing has changed in character from good old ticking, casting and vouching to Computer systems audit, security audit, risk assurance and on line audit. The management consultancy assignments, systems and procedures development, financial analysis and advice are today incomplete without an in-depth knowledge and skill of IT and requisite expertise in use of the tools available to work in the new environment."
(http://www.accountancy.com.pk/articles.asp?id=7)

The current trend sets a new agenda for schools to cultivate future professionals as life-long learners, effective communicators, team players, critical information users

and independent thinkers. Most important of all, the younger generation should be equipped with ability to use ICT tools for various tasks. Within this climate, schools at all levels are under mounting pressure to integrate technology into educational practice. Organization for Economic Co-operation and Development (OECD) advanced three rationales for utilizing ICT in education: economic, social and pedagogical (2001). That is to say, ICT skills are the demand of knowledge economy and information society. For pedagogical purposes, ICT can provide a resource-rich environment and support learner-centered approach. Bransford and associates (1999) focused on the pedagogical potential of technology and summarized it in five aspects. ICTs can bring real-world problems into the classroom; provide tools and opportunities for teaching and learning; help the process of feedback, reflection, and connecting to local and global communities.

The importance of technology in educational realm has been widely accepted and computers have been spread in schools. Issues related to how technology transforms teaching and learning have become a focus of educational research. For examples, Cuban (2001) claimed technology in schools was oversold and underused. Still, there has been increasing evidence on positive effect of technology in learning (Fadel & Lemke, 2006). Law et al. (2002) documented the evidence of learning outcome gained through ICT integration. The innovative practice of ICT integration was found to enhance information literacy, critical thinking, self-directed learning and collaborative skills.

The introduction of computers in schools began in early 1980s. Teachers use ICT to provide a complete set of resources for their lessons so that students can access at any time. As reported in Pelgrum and Law (2003), some countries have set up some form of 'IT driving licence' for both teachers and students, prescribing the minimum ICT competence expected (e.g. NCATE, 1997; ISTE, 1998, EURYDICE, 2000).

Moreover, teachers use ICT because they would believe that their students need opportunities to visualize and interact with these processes in simulations in order to develop their understanding. More and more countries recognize the importance of the role of ICT in education. In this connection, the need of acquiring ICT competencies, which are integrated into pedagogical practices, has emerged as a high priority in the education systems. Some Asian systems, e.g. Hong Kong and Taipei, a heavy emphasis on developing teachers' general technological skills in using ICT was found in the initial stage of the ICT implementation in education (Law & Plomp, 2003), e.g. four levels of ICT competency for teachers were proposed in the document entitled "Information Technology for Learning in a New Era: Five-Year Strategy

1998/99 to 2002/03" (EMB, 1998). A detailed discussion of the four levels (BIT, IIT, UIT & AIT) was reported in Au, Kong, Leung, Ng & Pun (1999). However, developing teachers' ICT competence is the first, but not the most important step in teacher professional development in the information age (Pelgrum & Law, 2003). It is widely recognized that teachers need to develop knowledge and skills to use ICT in meaningful ways to reform pedagogical practices (Law & Plomp, 2003).

2.2 Information Literacy and 21st Century skills for Students

The 21st century skills the future generation should be equipped with include critical thinking, global awareness, communication skills, information literacy, etc. (Fadel & Lemke, 2006). As a critical part of life-long learning, digital literacy is not just about computer skills. It also includes a set of competences such as information searching, handling and evaluation (OECD, 2001). Similarly, information literacy is defined as the ability to master the processes of becoming informed. As such IL is an essential capability needed by Hong Kong residents to adapt to the digital culture, globalization and the emerging knowledge-based society. The objectives of the IL framework development are therefore, to enable our students to master the required information processing skills and understandings, to develop our students as reflective learners, to enable our students to be appreciative of the value of independent and interdependent learning, and to empower our students with greater autonomy and social responsibility over the use of information. The Hong Kong Research Team (EMB, 2005b) proposed that IL standards, including the four dimensions as illustrated in the figure below: cognitive, meta-cognitive, affective and socio-cultural, should be formulated for our students. To make these standards observable, they have been linked to indicators and then sets of learning outcomes at the four key learning stages, primary 3, primary 6, secondary 3 and secondary 6. Such sets of learning outcomes are expected to be the minimum requirements that our students should achieve when they reach the corresponding stage.
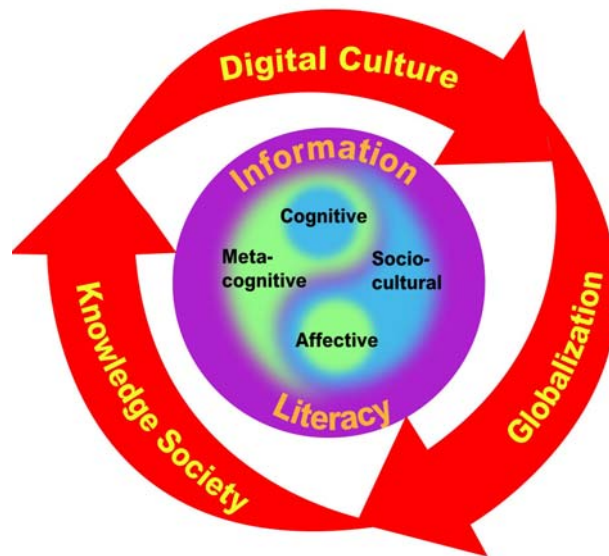
To embrace all the aforementioned dimensions of information literacy, eleven standards and thirty-two indicators were subsequently formulated. Out of the eleven standards, four: C1, C2, C3 and C4 fall in the cognitive dimension, three: M1, M2 and M3 fall in the meta-cognitive dimension, two: A1 and A2 fall in the affective dimension whilst the other two: S1 and S2 fall in the socio-cultural dimension. An information literate person is able to:

Cognitive dimension
- C1 determine the extent of and locate the information needed;
- C2 apply information to problem-solving and decision making;
- C3 analyze the collected information and construct new concepts or understandings;
- C4 critically evaluate information and integrate new concepts with prior knowledge;

Meta-cognitive dimension
- M1 be aware that information processing is iterative, time-consuming and demands effort;
- M2 plan and monitor the process of inquiry;
- M3 reflect upon and regulate the process of inquiry;

Affective dimension
- A1 recognise that being an independent reader will contribute to personal enjoyment and lifelong learning;
- A2 recognise that information processing skills and freedom of information access are pivotal to sustaining the development of a knowledge society;

Socio-cultural dimension
- S1 contribute positively to the learning community in knowledge building; and
- S2 understand and respect the ethical, legal, political and cultural contexts in which information is being used.

2.3 Content for Teacher Professional Development

The importance of technology in educational realm has been widely accepted. Although computers spread widely in schools, whether they transform teaching and learning remains controversial. Cuban (2001) claimed technology in schools was oversold and underused. Still, there has been increasing evidence on positive effect of technology in learning (Fadel & Lemke, 2006). For example, Law and her associates (2002) documented the evidence of learning outcome gained through ICT integration. The innovative practice of ICT integration was found to enhance information literacy, critical thinking, self-directed learning and collaborative skills.

Among the factors that determine ICT integration in schools, teachers are found the most crucial (Mumtaz, 2000). The teacher factor involves teachers' pedagogical belief, collaboration and interaction with peers, technical competence and attitude towards technology. Among these elements, teachers' pedagogical beliefs and computer skills were found to be most correlated with the integration of ICT in their classroom. The other two influential forces are institution and resource. Teachers are central to ICT adoption at the classroom and student level. (OECD, 2001)Similarly, Zhao and associates (2002) denoted that to integrate technology in classrooms, teachers needed to have sufficient technology proficiency; consciously use technology to meet pedagogical needs; and mobilize social support in school.

Gillespie (2006) pointed out the importance of both technical training and pedagogical knowledge of using ICT. Teachers not only need to know how to maneuver hardware and software device, but also when and why. However, most staff development in ICT concentrate on the technical aspects rather than the pedagogical use (McCarney, 2004). Still, computer skills are the basis and should be acquired before exploring pedagogical possibilities (Snoeyink & Ertmer, 2002). In addition, the teachers' training delivered in "one-size-fit-all" fashion is not effective and desirable. Training on IT skills should be offered on the "need to know" basis (Littlejohn, 2002). Preston (2004) advocated the differentiated programs to meet the diverse needs of teachers at various levels. The content should be tailored to subject-specific requirements (OFSTED, 2002), and concrete, grade-specific integration ideas should be presented at the training sessions (Snoeyink & Ertmer, 2002).

Regarding the educational technology standards and performance indicators, we found one of the well-established standards in ICT in education was the National Educational Technology Standards for both Teachers and Students (NETS•T and NETS•S) developed by the International Society for Technology Education (ISTE, 2000a; 2000b) in USA. The standards and performance indicators developed by ISTE were deeply rooted from the interests of various groups related to ICT and education. The ISTE standards for teachers could definitely provide us a good reference to consider content needed to be included in teacher professional development. The ISTE educational technology standards and indicators include the following six dimensions:

1. Technology Operations and Concepts
2. Planning and Designing Learning Environments and Experiences
3. Teaching, Learning, and the Curriculum
4. Assessment and Evaluation
5. Productivity and Professional Practice
6. Social, Ethical, Legal, and Human Issues

Further to the development of NETS•T and similar standards, Kirschner and Davis (2003) identified six benchmarks of good practices for ICT in teacher education including both pre-service and in-service programmes, in which teachers become: (1) competent personal users of ICT, (2) competent to make use of ICT as a mindtool, (3) master a range of educational paradigms that make use of ICT, (4) competent to make use of ICT as a tool for teaching, (5) master a range of assessment paradigms which make use of ICT, and (6) understand the policy dimension of the use of ICT for teaching and learning.

In the UNESCO report on ICT in teacher education (UNESCO, 2002), it is suggested that the ICT competencies are organized into four groups: pedagogy, collaboration and networking, social issues, and technical issues. "Pedagogy is focused on teachers' instructional practices and knowledge of the curriculum and requires that they develop applications within their disciplines that make effective use of ICT to support and extend teaching and learning. Collaboration and Networking acknowledges that the communicative potential of ICT to extend learning beyond the classroom walls and the implications for teachers development of new knowledge and skills. Technology brings with it new rights and responsibilities, including equitable access to technology resources, care for individual health, and respect for intellectual property included within the Social Issues aspect of ICT competence. Finally,

Technical Issues is an aspect of the Lifelong Learning theme through which teachers update skills with hardware and software as new generations of technology emerge" (p.41).

2.4 Models of Professional Development

Putnam and Borko (2000) maintained that teacher learning should be grounded in teaching practice. Along the same line, Silin and Schwartz (2003) argued that teachers' buy-in to curricular reform was best achieved when change agents adapted their program to the daily needs and problems of classroom teachers. In light of this, Preston (2004) recommend practice-based and constructive learning for teachers. Project-based approach, Littlejohn (2002) reported, received positive feedback among teachers since they had opportunity to balance learning and practicing. In addition, teachers' professional development needs to be sustained. Garet and his associates (2001) found that "sustained and intensive professional development is more likely to have an impact" (p. 935). Putnam and Borko (2000) proposed a model which combines intensive workshop introducing "theoretical and research-based ideas with ongoing support during the year as teachers attempt to integrate these ideas into their instructional programs" (p.7).

The design and delivery of the professional development program is a process that teachers must be taught explicitly and developed over time. Teachers must first comprehend and question the learning-to-teach process from within their own limited and personal perspectives developed over years of observing teachers. While the details of innovative programs differ, similarities include:

- taking the teachers' experiences and concerns as central in discussions that enable them to study their own fledgling practice as they work to see the theory involved in practical decisions,
- creating collaborative environments (within student cohorts, between school boards and faculties, within university departments, and among teacher educators, trained mentors, and candidates) that model inquiry with and within communities of practice, and
- making explicit what teachers actually do and think in the course of planning, implementing, and evaluating their teaching.

Teacher development could be done in professional practice schools (Lieberman & Miller, 1990), for examples, the Georgia Leaning Connections (GLC) of Georgia Department of Education offers a web-based professional development center (http://www.glc.k12.ga.us/ProDev/), which provides a comprehensive collection of

resources to meet the needs of professional practice schools including audio and video clips, expert opinions, interactive activities and discussion starters that deal with the topic of information literacy. Garet et al. (2001) examined the policy mechanisms and processes in relation to teacher professional development, and findings indicate that school districts can use to provide quality in-service professional development for teachers. Furthermore, Dutro et al. (2002) argues that professional development should be started by a government reform initiative, when envisioned as a professional development opportunity, impacted teachers' capacities to become change agents in their classrooms and districts and how individual district contexts shaped the development of those capacities.

Moreover, peer support in terms of school collaboration could be an effective mode of professional development (Glazier, 2004; Pennell & Firestone, 1996). The aims include offering an outside view in helping the headship with boundary management and management of people within boundaries. Helping them with how they see the school and enabling them to formulate plans for action (Bush & Coleman, 1995). Putnam and Borko (2000) described the pivotal role of discourse communities in supporting teachers learning to teach in new ways, as McLaughlin and Talbert (1993) attributed the success of systematic reform to teachers' participation "in a professional community that discuss new teacher materials and strategies and that supports the risk taking and struggle entailed in transforming practice" (p. 15). The initial success of a field-based project in Texas provides another illustration (Wilmore, 1996). A school-based instructional leadership team was set up, including teacher educators, principal, mentor teachers, and a small cohort of candidates, focused on integrating learning and teaching "to directly tie theory to practice" (Russell, McPherson, & Martin, 2001).

As an approach to professional development, school-university collaboration could be in form of mentoring. Mentoring is an important mode of professional development in many countries. It involves an external expert supporting the development of new pedagogy for teachers. The mentor provides encouragement and support; and mentoring is designed to support the process of finding which involves understanding the nature of the school as a system. To conclude the role of school collaboration and mentoring from institutions, all these assist teachers in schools by: acting as a sounding board; offering encouragement; building confidence; encouraging positive attitudes; clarifying the role of headship; and brainstorming strategies and tactics for future development (Bush & Coleman, 1995).

To sum up, ASCD (2004) proposed the following strategies or models for designing

professional development: study groups, action learning, peer coaching and review, collaborative planning.

Study Group

The main purpose of setting up a study group of teachers is for sharing understanding and practices of using IT in teaching science. The content to be studied includes the following items (ASCD, 2004):

- design curriculum and instruction innovations
- integrate a school's practices and programs
- study the latest research on teaching and learning
- monitor the impact of new practices on students and staff
- analyze and target a school wide need

We drawed experience from Murphy (1992; pp. 71-74) to learn the implementation of a study group. Some important points are list as follows.

- Study groups provide a regular collaborative environment for teachers of varying backgrounds, knowledge, and skills.
- Establishing and keeping a regular schedule is critical to the success of study groups.
- Schools get better as the adults in the building develop a shared understanding of good teaching and learning.
- Active participation by the principal clearly communicates the importance of study groups.

Action Learning

Yuen and Cheng (2000) argued that action learning could help teachers gain the necessary professional competence for making better judgments and taking effective action in ambiguous situations and thus enhanced teachers' professional practice and performance in a changing and uncertain environment. Major features of action learning are summarized as follows (Marquardt, 2000):

- Action learning is built around a diverse group of people (whole systems) asking new and fresh questions so as to gain a full picture of the problem and its context before attempting to solve it.
- Action learning enhances the ability to think in new and fresh ways about existing reality and problems via critical reflection, reframing, and context shifting.

- Action learning creates the conditions in which managers learn from their own experience in a real-life problem, helped by and helping others facing similar situations.

While knowledge is often thought to be the property of individuals, a great deal of knowledge is both produced and held collectively. Such knowledge is readily generated when people work together in the tightly knit groups known as "communities of practice" (Brown & Duguid, 1998). Action learning and communities of practice offer a new way of looking at and approaching professional development for school professionals.

Thus, a multi-level professional development model with an emphasis on action learning and communities of practice would be considered. One local example of taking action learning in teacher professional development is the project "Development of an Interactive Platform for Good Practices" (www.emb.gov.hk/gp), which is an EMB project commissioned to the CITE of HKU.

Peer Coaching and Review

Single training sessions with no follow-ups are ineffective. Activities that deploy sessions spaced over time have better results, particularly if those sessions include presentations of theory, demonstrations of new teaching skills, and opportunities for teachers to practice and receive feedback.

The idea of peer coaching is very similar to study group. It involves two teachers taking classroom observation of each other. Then they discuss their findings and share their teaching practices. The main purpose is to promote collegiality and support.

In general, there are two main types of coaching: coaching by experts and coaching by peers-where teachers have an opportunity to observe one another and provide feedback and support. (Interestingly, some evidence suggests that peer coaching may be more effective than coaching by experts.) Giving teachers structured time to discuss new concepts and experiences can also enhance the effectiveness of training.

The reasons of peer coaching could be summarized as follows (ASCD, 2004).

- It provides job-embedded, ongoing professional support.
- It allows teachers to work together professionally, thereby eliminating feelings of isolation.
- It encourages reflection and analysis of teaching practice.

- It promotes specific feedback over time.
- It fosters collaboration among teachers throughout the school building.

Collaborative Planning

Collaborative planning starts from a group of teachers. It provides opportunities for teachers to work together during the school day. Its main purpose is to connect teachers' learning to students' learning by examining their teaching practice and then developing their skills. Some important points are listed as follows (ASCD, 2004).

- Plan curriculum, units, or lessons including classroom-based assessments
- Examine student work
- Examine teacher work
- Plan use and evaluation of instructional practices
- Develop school improvement plans using student data

Raywid (1993) provided some successful examples of collaborative planning in schools. These examples further illustrated the significance of a school as a learning organization that fostered the spreading of knowledge within the school. As a result, continuing growth and improvement of a school became possible.

In addition to the ASCD (2004) models, UNESCO (2002) suggested strategic approaches that help teacher educators develop ICT competencies for teachers, which include context and culture, leadership and vision, lifelong learning, and management of change. "Context and Culture identifies the culture and other contextual factors that must be considered in infusing technology into teacher education curriculum. It includes the use of technology in culturally appropriate ways and the development of respect for multiple cultures and contexts, which need to be taught and modelled by teachers. Leadership and Vision are essential for the successful planning and implementation of technology into teacher education and require both leadership and support from the administration of the teacher education institution. Lifelong Learning acknowledges that learning does not stop after school. In common with the other themes, it is important that teachers and teacher preparation faculty model lifelong learning as a key part of implementation, and as an ongoing commitment to ICT in teacher education. Planning and Management of Change is the final theme, born of today's context and accelerated by technology itself. It signifies the importance of careful planning and effective management of the change process" (p.40).

2.5 Incentive and Assessment

To motivate teachers, the training has to be designed as an answer to their needs(Silin & Schwartz, 2003). Teachers need to have a clear understanding of what new ICT tools could offer and be convinced of the necessity of learning new skills. Thus, the rationale for educational use of technology should be clearly articulated (OTA, 1995). At the same time, compatible evaluation and promotion system should be in place (OTA, 1995). It will greatly promote teachers buy-in when decisions regarding promotion take technology integration into account. Technology integration into classroom can also be promoted through increased access to computers and on-going support. Cunningham and associates (2003) reported a project of offering laptops for teachers which yielded in more confident and competent use of technology in their classrooms. Additionally, teachers need ample time to explore, digest and experiment with technology for pedagogical purposes (Schrum, 1995). A comfortable and encouraging environment might be essential.

Traditional standardized test, it was pointed out, was not suitable for assessing professional development aiming at ICT-supported innovation (OTA, 1995). Gillespie (2006) claimed that measurement should focus on the improvement in the quality of teaching and learning, in simpler words, students' learning outcome. The ultimate purpose of teachers' professional development is to enhance teaching and learning anyhow. Along the same line, Preston (2004) denoted that accreditation should be related to classroom activities. She also proposed the school-based peer assessment and accreditation portfolios published for reference of all. Self reflection report was also viewed as extremely valuable activity by teachers (Littlejohn, 2002).

Part 3: Stakeholders' Views on Teacher Professional Development (TPD)

Introduction

The capacity of any professional development endeavours to achieve sustainable change in teacher practice is affected by a multitude of factors (Wells, 2007). To identify these factors and to deepen our understanding of how they interact with one and other, a total of 11 focus group discussion sessions and 7 in-depth interviews with various practitioners and stakeholders were conducted during June - July 2006. In the following sections, key findings of the focus-group discussions and in-depth interviews will be presented.

Sampling

As espoused above, the purpose of conducting focus-group discussions and in-depth interviews was neither hypothesis testing nor to provide an extensive evaluation of all TPD initiatives implemented in the past, but to enable the researchers to gain insight into the defining factors conducive to sustaining teacher professional development. Thus, purposeful and convenient sampling (Flick, 1998; Miles & Huberman, 1994) was adopted in this study. At classroom level, teachers from primary and secondary sectors were selected from a wide range of subject or key learning areas in order to ensure and maximise the richness of data. The subject or key learning areas selected include Chinese Language, English Language, Mathematics and Science, Humanities, Liberal Studies, General Studies, Visual Arts, Music, Physical Education. The entire cohort of subject teachers comprises eight focus-groups with a total of 52 respondents. At school level, school leaders at different levels were also selected for focus-group discussions, as school leadership is often conceived as a lever for sustaining change and development in school (Fullan & Hargreaves, 1996; Fullan & Steigelbauer, 1991). These groups of leaders consist of curriculum officers from primary schools, and vice principals and principals from primary and secondary schools. At system level, representatives from EMB, members from Curriculum Development Council (CDC), curriculum development officers from Curriculum Development Institute (CDI) were invited to have an in-depth interview with the researchers. In addition, representatives

from the four teacher education institutes (TEIs) were invited to share their views on IT professional development as they are one of the key providers of TPD services. The demographic information of different groups of respondents is given in Table 1.

Table 1: Demographic data for the focus group discussions and in-depth interviews

Level	Categories	No. of participants
Classroom	language teachers from primary schools	4
	language teachers from secondary schools	7
	Math/Science teachers from primary schools	6
	Math/Science teachers from secondary schools	6
	General Studies (GS) teachers from primary schools	9
	Humanities/Social/Liberal Studies (LS) teachers from secondary schools	6
	Visual Arts, Music, Physical Education & other subject teachers from primary schools	7
	Visual Arts, Music, Physical Education & other subject teachers from secondary schools	7
School	Principals from primary and secondary schools	8
	Curriculum officers from primary schools	9
	Vice principals or Dean of Studies from secondary schools	6
System	Representatives from EMB	4
	Curriculum development officer of GS from Curriculum Development Institute	1
	Curriculum development officer in LS from Curriculum Development Institute	1
	Member from the Curriculum Development Council (Primary Section)	1
	Member from the Curriculum Development Council (Secondary Section)	1
	Teacher Education Institute (TEI) representative from CUHK	1
	Teacher Education Institute (TEI) representative from HKBU	1
	Teacher Education Institute (TEI) representative from HKU	1
	Teacher Education Institute (TEI) representative from HKIE	1
	Total:	87

Focus-group Discussion and Interview Design

The focus-group discussions and in-depth interviews basically encompassed a set of semi-structured questions for probing respondents' (1) experience in ICT implementation at classroom or school levels and professional development pertinent to ICT in education; (2) understanding of the notion of information literacy and its relationship with other subjects; (3) views on future professional development and its model of delivery; and (4) expectations and challenges. As the entire cohort of respondents comprised of heterogeneous groups of stakeholders, the questions for discussion and interview derived from the four domains will be tuned in a manner to address the uniqueness of each group. For instance, while eliciting teachers' experience in integrating ICT into their teaching practices as stipulated in Domain (1) during the focus-group session, the discussion with members of CDC will focus on probing the respondents' perception of the role of ICT in the school curriculum. A detailed list of questions is given in Appendix 1. Each discussion or interview session lasted for approximately one and a half hour, which started with a brief introduction, explaining the background and focus of the consultancy project, followed by a semi-structured discussion session. All discussions and interviews were digitally recorded with consent from the participants, and transcribed and coded for further analysis.

Key Findings

Experience with ICT Practices

Classroom level

The group of teachers being interviewed exhibited a wide range of ICT usage in their classroom practices. Most of the language teachers responded that presentation software applications, such as MS Word and Powerpoint are the common tools they use in classroom to enhance their instructions. Some of them thought that the primary focus of most of the language lessons was to provide opportunities for students to read, write, listen and speak, thus the use of ICT had little effect on helping students to develop their language skills. Some teachers indicated that their schools have no explicit curriculum plan for making use of the Multi-Media Learning Centres (MMLCs). Course management systems are often used as a repository for hosting and

accessing teaching and learning materials as well as submission and distribution of assignments. ICT can be used to provide GS and LS teachers claimed that they often used ICT to support students' project learning, as the Internet can provide more authentic resources and first-hand information for both teaching and learning. Among various resources, the teachers found that online newspapers and quality documentaries were very useful for curriculum tailoring. Apart from providing access to vast information, some teachers expressed that IT was used as a learning tool for students to construct knowledge and articulate their thoughts and also as a tool for assessing student learning. In some schools, with the use of hand-held devices and wireless networks, they were able to provide students with more authentic learning experience. On the other hand, most of the primary school mathematics teachers reported that the use of ICT to support teaching and learning was rare. The reasons for that were mainly due to the lack of appropriate software and the availability of computer facilities. Some science teachers claimed that the use of data-logging devices to support teachers and students to conduct scientific investigations is common. Apart from that, they sometimes employ computer animations or simulations for illustration of different concepts.

School level

Some primary school teachers pointed out that, with the curriculum officer's coordination and support, collaboration among teachers within and across subject panels on integration of IT into subjects has been strengthened. While the school intranet helps to disseminate school information, it also provides a platform for teachers to share their teaching resources and to exchange teaching ideas. Despite the evidence that a collaborative culture is emerging and taking root in school, some teachers expressed that the collaboration and experience sharing among schools has been deteriorating. This could be attributed to the rising competition among schools, especially those situated within the same district, as a result of the declining student enrolment in recent years. Some schools adopt a managerial approach to infusing IT into curriculum by stipulating the amount curriculum time dedicated to teaching with IT. It is evident that IT implementation has brought about changes in assessment mode of and for learning. In some schools, they have replaced one of their traditional examinations for General Studies by requiring students to conduct a WebQuest project.

Professional development

Some teachers opined that the IT training courses (especially those offered during 1998-2003 era) were too much skill-oriented, with relatively weak emphasis on pedagogical strategies and no direct connection to their teaching practices. As time goes by, most of the skills acquired have been washed away. At the design level, some courses failed to make distinctions among different kinds of school and classroom contexts, or between the needs of novice and experienced teachers. Regarding teacher's IT competence, some held the view that the IT training courses provided a good entry point for teachers to understand the notion of IT in education. They also helped to establish a school culture in using IT to support teaching and learning. Some respondents agreed that the portfolio assessment scheme provided flexibility for teachers to provide evidences about their IT competence. However they also raised the concerns about the loopholes in this assessment approach that great variability in terms of the quality of the portfolios can be found across schools.

In terms of school-based professional development, some schools have identified a "seed teacher" in each subject area to serve as a supporter to other colleagues in using IT for teaching and learning. IT Induction programmes were provided for newly recruited teachers in some schools. In some schools, they often invite experienced teachers from other schools to conduct workshops and seminars to share their experience in particular areas of IT in education. This kind of experience sharing was generally welcomed by teachers and principals. However, some teachers responded that, the declining number in student intake has been intensifying the competition among schools, especially those within the same district. This kind of competition may to a certain extent jeopardize the development of a collaborative culture among neighbourhood schools.

Perceptions on Information Literacy (IL)

Respondents' views on information literacy (S. C. Li, Kong, Lee, & Henri, 2006) are rather diverse. Some teachers equated IL as issues related to affective domain, such as the issues of computer crimes, plagiarism and infringement of intellectual property right while others associated IL with project-based learning, as in PBL, students are often required to search and process a large amount of information. Some contended that IL should be subsumed under the domain of Library Science and some held the view that IL should encompass both information and technology. Despite these

divergent views, respondents generally agreed that the notions of IL and ICT in education are interweaving with one and other.

Regarding integration of IL into curriculum, although the TEI representative and EMB Officials claimed IL should be taught in every subject, most of the science and mathematics teachers thought that the subjects they taught had relatively weak linkage to IL, some maintained that IL can be integrated into the curriculum area on Science, Technology and Society (STS). As information collection, processing and synthesising are the essential elements required in teaching and learning of Liberal Studies, most LS teachers agreed that Liberal Studies provides a suitable platform for incepting information literacy. Some principals insisted that the notion of information literacy should be instilled in students at their earlier learning stage, say, senior primary level, through learning General Studies. The curriculum content should enable students to understand and respect the ethical, legal and cultural contexts in which information is being used, to use information in a responsible way, and to be aware of the implications of technology on society, etc. In terms of the articulation of IL in the existing curriculum, three models have been identified:

Full Integration Model

Some teachers believed that information literacy should be fully integrated into or across subjects as it is the ultimate goal of IT in education. Some also uttered that it is hard to teach cognitive or metacognitive skills as espoused in the IL framework, without any connection to any subject matters. So, the development of students' IL skills should not be divorced from the development of subject knowledge.

Hybrid Model

While acknowledging the need to infuse IL into and across subjects, some teachers and principals opined that it would be more effective to have a separate subject to help students develop the basic knowledge and skills pertinent to information searching and retrieval skills, Chinese inputting methods, use of particular software applications and Internet tools, intellectual property right, Internet crimes, etc.

Separation Model

To the other end, it was deemed that students' IL skills can be developed through library and IT lessons. Those who supported this view believed that this model helps

to ensure the allocation of resources for IT in education within a school and is the most convenient and least disturbing approach to IT implementation. Some were worried that it is difficult to ensure the delivery of a consistent and structured ICT curriculum when the full-integration model is adopted.

Professional Development Framework and Training Needs

Pedagogical orientation

To facilitate better integration, some respondents opined that the focus of teachers' professional development should be geared towards more subject-based, centering on the pedagogical use of IT in classroom practices. Some teachers pointed out that, in order to enhance the transferability of the knowledge acquired, it was desirable to incorporate in the content of the training courses a rich repertoire of exemplary lessons that can be adapted in a variety of contexts and settings. EMB officials suggested that scholars from universities can help teachers to develop the new pedagogies by providing theoretical guidance and support.

Catering for diversity

As teachers' needs on IT in education are heterogeneous and rather diverse, some teachers opined that it is not plausible to have a one-size-fit-all model for teacher professional development. A variety of choices and modes of delivery of IT training programmes is deemed necessary to meet teachers' demands. Despite the call for strengthening IT professional development with more pedagogical substance, some teachers expressed that those TPD programmes which help teachers to master new technologies should not be ignored. They emphasised that the life-cycle of technology is becoming shorter and shorter and there are new technologies constantly emerging, which may provide new solutions for establishing better learning environments and new opportunities for enhancing learning and teaching.

CPD hours

While teachers generally welcomed the idea of making IT professional development non-mandatory, some of the respondents pointed out that the coupling of IT training hours with CPD hours could not help much in promoting teachers' subscription of the courses. Instead, the relevancy and applicability of what is to be delivered in the training are teachers' prime concerns. They indicated that there were a lot of training

opportunities available that could already exhaust or absorb most of their CPD hours, especially those mandated CPD to prepare teachers for implementing the New Senior Secondary (NSS) curriculum.

TPD and its Sustainability

Some principals raised their concerns about the sustainability of the IT training and how to enable teachers to bring back the innovations and ideas they have acquired during the training to their classrooms and contextualize them in their teaching practices. During the discussion, some suggested a 'school clustering approach' to teacher professional development. The notion of this approach is that teams of teachers, comprising of subject teachers and curriculum leaders from each cluster school, join together to work on solutions for common problems they envisage in classroom or experiment with new ideas in their teaching practices through action learning. The training programme may comprise of a series of action studies on the new practices. This school clustering model is expected to provide a rapport among cluster schools and on-going communal support for teachers even when they exit the formal training courses. To facilitate implementation of the new initiatives, some teachers responded that leadership programmes should also be provided for curriculum leaders and school principals.

Implications

As expected, the data reflects that there is a wide range of ICT usage in teachers' teaching practices. While some teachers exhibit high competence of using ICT to effectively enhance learning and teaching, there are teachers who lack the skills and pedagogies in using technologies to improve their practices. Interestingly, this disparity is not bound to teachers from a particular subject or a particular key learning area. The gap exists among Language teachers as well as Science and Mathematics teachers. To bridge the gap and to effect a change in teachers' practices, a culture of collaboration should be instilled in school. The collaborative culture can be promoted through a variety of collegial exchanges within school, such as, experience sharing, lesson observations, collaborative lesson-planning and lesson study (S. C. Li, 2007; Stigler & Hiebert, 1999) etc. At school level, a mechanism should be in place in school to facilitate teachers and administrators and curriculum leaders to plan, to evaluate and to reflect upon their ICT practices.

In terms of the TPD content, there was a strong call for more pedagogical and subject-specific orientation, despite the fact that pedagogy was already stipulated as one of the pivotal elements at all levels of IT professional development in (Au, Kong, Leung, Ng, & Pun, 1999). Some courses failed to address the needs of individual teachers as they might come from very different backgrounds and school-settings. (Brand, 1998) cautions against the one-size-fits-all model, suggesting that it is essential to involve everyone in planning to create ownership of the process. As expounded in (Garet, Porter, Desimone, Birman, & Yoon, 2001), to effect a change in teacher's practice, teacher professional development should possess three core features: (a) focus on content knowledge; (b) opportunities for active learning; and (c) coherence with other learning activities. In designing the delivery of TPD, it is necessary to change from 'just in case' mode to 'just in time' learning approach (Schrum, 1999).

It is important that teacher professional development pinpoints the necessary knowledge and competence that will help teachers analyse and reflect on environmental changes and develop appropriate strategies to make continuous improvement and development (S.C. Li, Law, & Lui, 2006). Traditional teaching training is usually carried out by means of formal short-term courses to provide teachers with opportunities to refresh and update their knowledge of the developments and implementations of innovative curricular design and pedagogical practices. Teachers are then expected to bring back to their classrooms what they have acquired during the training. But when teachers exit the formal training courses and return to the real students in the real classrooms, the channel for resource exchange, knowledge communication and peer support has already been terminated and teachers are on their own again. Traditional teacher training is segregated from the day-to-day work of teachers and is therefore limited in its utility, vitality and impact. As any other form of experiential learning, the professional development of teachers critically involves experience and also a systematic approach to learning involving reflection, conceptualization and planning (S. C. Li, Wong, & Law, 2000). In this way, the new experience will be informed by learning from the past and from the experience of others. The building of a community of practice is critical in teacher education. Teachers not only need to overcome isolation from other teachers and share experience and resources with peers in an environment equipped with tools for professional discourse, they also need equal access to teacher training opportunities and ongoing support for the change process. To enable curriculum innovations to take root in school, the focus of TPD programmes should not centre on the dissemination of the practices alone but also take into consideration of sustaining the support for the participants to implement and contextualize the new practices in their schools.

Being involved in change requires teachers to be reflective in their practices and desire to change their current teaching status. Thus, change in pedagogical practice must be incremental and specific (Sugar, 2005).To effect and sustain change and improvement in pedagogical practices with ICT, it is necessary to develop a culture that embraces technology innovations (Lieberman & Miller, 1991), encourage teacher collaboration, provide continual follow-up support within a teacher's classroom (S. C. Li et al., 2000; Marx, Freeman, Krajcik, & Blumenfeld, 1998). In addition, the design of teacher professional development must be connected and aligned with the wider education reform initiatives.

Part 4: Consultation Seminars

A Report of the Four Consultation Seminars on the 'Revamp of the Teachers' IT Training Framework'

Four two-hour consultation seminars were conducted from April to May 2007. About 300 practitioners had participated in these consultation seminars and made enquiries and comments upon the implementation of the proposed framework. Table 1 shows the details of the consultation seminars.

Table 1: The details of the consultation seminars

Date	Venue	Language	Number of participants
17 April 2007	The Hong Kong University	English	21
24 April 2007	Kowloon Tong Education Service Centre	Chinese	93
2 May 2007	Kowloon Tong Education Service Centre	Chinese	180
4 May 2007	The Chinese University of Hong Kong	Chinese	45
		Total:	339

The key points made by the participants and the major responses made by the Consultation Team in terms of nine aspects are summarised below.

1. Mode of Delivery

Enquiries from the Participants:

Participants enquired about the **types of supports** that will be provided by the teacher professional development programmes under the proposed framework to realise the pedagogical use of technology.

Some participants further asked about the measures of the proposed framework to address the two major problems of previous ITEd professional development programmes, viz. the lack of fundamental training in IT skills and the lack of enrichment training in pedagogical strategies for using IT in teaching.

Responses from the Consultation Team:

Two major modes of delivery will be adopted in the teacher professional development programmes under the proposed framework to address such issues. The first mode is the organisation of **intensive workshops**. Such workshops will include the instruction in IT skills, the recommendations on relevant effective pedagogical strategies and the introduction of relevant incorporation of IL elements. Taking the professional development programmes for using blogs to teach language subjects as an example. In such programmes, the teacher participants will be equipped with technical knowledge and pedagogical strategies for using blogs, such as collaborative learning strategies, and the pedagogy of incorporating IL elements in the context. The second mode is the **provision of continuous professional supports** in a school-clustering approach. Professional discourses among teachers in school clusters and supports from the professional bodies in the education sector are the two key elements of such support.

Suggestions from the Participants:

Concerning the future teacher professional development under the proposed framework, some participants suggested that the span should be in **five to eight weeks** so that teachers can share their gains with their colleagues within school after the completion of the professional development programmes.

Post-seminar remark:

It is worthwhile to consider the abovementioned suggestion in planning the span of future teacher professional development programmes.

2. Support for Experience Sharing

Sharing from the Participants:

A participant demonstrated a good model of promoting ITEd by describing her successful experience in fostering the use of the Multi-media Learning Centre (MMLC) in the teaching of language subjects. This participant used the simple recording technologies in the **MMLC for teaching oral skills** in Chinese Language. Her work was recognised by her supervisors and colleagues after a series of within-school sharing. This participant stated that her teaching hours was reduced by the school senior management for the promotion of ITEd in her school. Based on her

experience, the centrepiece of insightful sharing is related to the issues about pedagogical strategies rather than the issues about technical knowledge of IT innovations.

On the other hand, another participant expressed his worry about the administrative constraints on the organisation of experience sharing within school. This participant asserted the rationale behind the emphasis on experience sharing, particularly in the area about the inclusion of IL elements, in the proposed framework. However, he pointed out that teachers were usually lack of time, resources and supports to share successful experience in using IT innovations in teaching even the teachers were self-initiated to try innovative IT and develop effective pedagogies.

Post-seminar remark:

Two implications in relation to the implementation of the proposed framework can be drawn based on the above two cases.

The first implication relates to the need of sharing of pedagogical experience in using IT for teaching and learning. The abovementioned cases imply that there is a possibility of organising schools to share the successful and failed experiences in the use of IT for enhancing teaching and learning.

The second implication relates to the allocation of resources in promoting the teacher participation in the future ITEd professional development programmes. The participant in the first case was provided with resources (in the form of reduction of teaching hours) to support the promotion of ITEd professional development programmes, whereas the participant in the second case had not received such kind of resources. This implies the need to motivate the school leadership to allocate resources for promoting teacher participation in ITEd professional development programmes. The Consultation Team will make reference to these two cases for the recommendations on the allocation of manpower resources in the implementation of the proposed framework.

3. Introduction of Incentive Scheme

Enquiries from the Participants:

Some participants asked about the **incentives** of the proposed framework to promote school encouragement to teachers for the participation in ITEd professional development programmes.

Responses from the Consultation Team:

Certain issues related to the development of ITEd are a part of criteria in the existing External School Review (ESR) system to some extent. Perhaps there is a need for explicitness in this area. It may be possible to make 'whether the school has organised ITEd professional development programmes', for example, as a criterion in the ESR system. The Consultation Team understands that this is a sensitive issue for schools. Further investigation on this issue should be conducted.

Instead of the incentives that focus on the ESR system, the Consultation Team suggests the incentives in relation to the development of school-based model to cater for the diverse levels of use of IT of individual schools. Such school-based model encourages **schools to develop plans** on the ITEd professional development programmes according to their own need. The central issues of such school-based model include the emphasis on the mission for 'making students learn better' and the belief of using IT for enhancement of teaching and learning.

4. Extent of Teaching Supports

Enquiries from the Participants:

Some participants enquired about the extent of teaching supports in offering resources, such as lesson plans and teaching materials, which the beacon schools and the needy schools would provide and receive, respectively, under the proposed framework. There were also proposals for building up a repertoire of central resources to support teaching and learning with IT.

Responses from the Consultation Team:

Under the proposed framework, all professional development programmes will provide teacher participants with **at least one subject-specific and level-specific example** on the implementation of the introduced pedagogical strategies and a set of corresponding teaching materials for the use of innovative IT in teaching. The

resources will be so detailed that teacher participants are enabled to try or adopt the acquired pedagogical strategies and the relevant resources with the least adaptation in their daily teaching. There should be a mechanism to build up a repertoire of central resources to support teaching and learning with IT.

5. Effect of ITEd Professional Development

Opinions from the Participants:

Some participants stated that the crux of unsatisfactory results of previous local ITEd professional development programmes was the generally **low self-motivation** of teachers. They indicated that a large number of teachers refused to use IT in teaching because they thought that IT was not very helpful in this aspect. In addition, the lack of sufficient IT resources and supportive working conditions in school also hindered teachers from applying innovative IT and relevant pedagogies that were learnt from the professional development programmes in their teaching. One of these participants pointed out that the new framework should focus on the **sharing of successful experience** in the pedagogical use of innovative IT rather than the training in technical knowledge about and skills in using IT innovations.

Responses from the Consultation Team:

The **school-clustering approach** adopted by the proposed framework emphasises the sharing culture.

Post-seminar reflection:

Two implementation issues are reflected from the abovementioned opinions. First, there is a need to further consider the **incentives for teachers and schools** to voluntarily participate in the professional development programmes under the proposed framework. Second, there is a need to further look into **the extent of sufficiency of IT infrastructure** in some schools.

6. Uncertainties of Teacher Participation

Opinions from the Participants:

Some participants pointed out that there would be two uncertainties in the future ITEd professional development programmes. The first one concerned the **fear of IT innovations** among teachers. One of these participants stated that local teachers generally felt stressful to use innovative IT in teaching because such teachers were doubtful about their mastery of using IT innovations, the teaching effectiveness of IT innovations, the technical support for using IT innovations, and the social issues involved in using IT innovations. This might hinder the eagerness of teachers to acquire the latest information about IT innovations. The second one concerned the **lack of feasibility studies** on IT innovations in Hong Kong. These participants stated that some local teachers felt disheartened to spend time on testing the innovative use of IT in teaching without teaching effectiveness assurance. To address these two issues, these participants pointed out that apart from encouraging experience sharing, the future ITEd professional development programmes should allow teachers to realise the ratio of cost and gain in using the targeted IT innovations for teaching before joining the relevant professional development programmes. This would help to reduce the pressure of teachers, especially for the non-IT teachers, in attempting the use of innovative IT for teaching.

Responses from the Consultation Team:

The proposed framework will be integrated into the current Continuing Professional Development (**CPD**) system. The content of the framework is opened to be designed flexibly. The central concern of the proposed framework falls on the organisation of clusters of schools which share common understanding and vision of ITEd and have willingness to attempt the use of innovative IT for teaching.

In line with the current global trend that there is an integration of introduction of pedagogical strategies and sharing of successful experience in teacher professional development, the professional development programmes under the proposed framework will have a diversity in the **introduction of pedagogical strategies** and a continuity in the **sharing of successful experience** in using innovative IT for teaching.

7. Difficulties in Framework Implementation

Opinions from the Participants:

Some participants asserted the design of content and the mode of delivery of future teacher professional development under the proposed framework. They indicated that the provision of online platform for course materials retrieval and telephone hotline for after-trial enquiries would be welcomed for smooth operation of the relevant professional development programmes. However, these participants were worried about two implementation issues in relation to the support by the school leadership and the government for the proposed framework. They were concerned about the **willingness of school heads** to fully support their teachers to join the ITEd professional development programmes. They were also concerned about the willingness of school heads to strictly follow the conditions from the government on **allocating the financial resources** for teachers' ITEd professional development.

Some participants expressed their anxiety over the school-wide ITEd professional development for teachers. These participants thought that the use of IT was not applicable for all of the subjects. There would be difficulties in drawing the willingness of teachers in all subject fields to participate in the ITEd professional development programmes and then apply the learnt knowledge and skills in their teaching. In addition, these participants were anxious about the successful organisation of intra-school and inter-schools experience sharing among teachers.

Post-seminar remark:

Two remarks are made regarding the above opinions. The first remark is that the proposed framework concerns the **support from the school leadership**. The second remark is that there is a need to look into the **measures to ensure the designated resources** are used for the purposes of teachers' ITEd professional development.

8. Certification of ITEd Professional Development

Opinions from the Participants:

Some participants indicated that the **certification** of future ITEd professional development programmes was very important because the current social trend was certificate-oriented. However, there were also concerns about the huge amount of human resources required in conducting the certification process. There were also opinions on offering certificates or rewards on the individual-teacher basis rather than

on the whole-school basis. Some participants also concerned about the assessment areas for certification by indicating that both the pedagogical use of IT and the technical knowledge of using IT should be included in the relevant assessments.

Responses from the Consultation Team:

The above opinions were in line with the consideration of the Consultation Team. One of the solutions was introducing the peer-reviewing system to resolve the labour intensive problem of conducting the certification system. In addition, certificates or rewards could be offered to recognise both the efforts of teachers on the individual basis as well as the efforts of school on the team basis. The four teacher education institutes should consider providing certification to competent and qualified school teachers who have completed the CPD. The proposed framework for designing the content of teacher professional development should include all four dimensions, which are technical knowledge, pedagogical integration, managing and leading ICT, and socio-cultural awareness.

9. Motivation for Less Self-initiated Schools

Enquiries from the Participants:

Some participants showed their positive views on the inclusion of IL elements and the school-based implementation model in the proposed framework. They noticed that the proposed framework emphasises the school awareness of ITEd professional development, and asked about what types of measures would be adopted to **motivate** and support the school which had less awareness in this aspect.

*Responses from the Consultation Team:*

A school-based model will be adopted to address this issue. **Schools** will be invited to make the **ITEd plan** according to their own needs and development paces. All parties in schools, viz. school leadership, teachers and students, will be included in the planning stages. In this regard, schools can select an integration model or separation model for their teachers to participate in the relevant ITEd professional development programmes.

Part 5: A Framework for Designing Teacher Professional Development

The main objective of using educational technology is to enhance students' learning. Besides that, teachers' continuing professional development (CPD) (ACTEQ, 2003) emphasizes lifelong learning, and learning extended to a wider community. We are aware of the need to connect student learning to teacher professional development. For this reason, an appropriate framework for designing teacher professional development is required to fill in the gap. First of all, Loucks-Horsley, Love, Stiles, Mundry & Hewson (1998; pp. xxv-xxvi) provide 5 general observations about teacher professional development.

1. Professional development experiences need to have students and their learning at their core. And by that we mean all students.
2. Excellent teachers have a very special and unique kind of knowledge that needs to be developed through their professional learning experiences.
3. Principles that guide the reform of student learning should also guide professional learning for educators.
4. The content of professional learning must come from both inside and outside the learner, and from both research and practice.
5. Professional development must both align with and support system-based changes that promote student learning.

Figure 5.1 Professional Development Design Steps
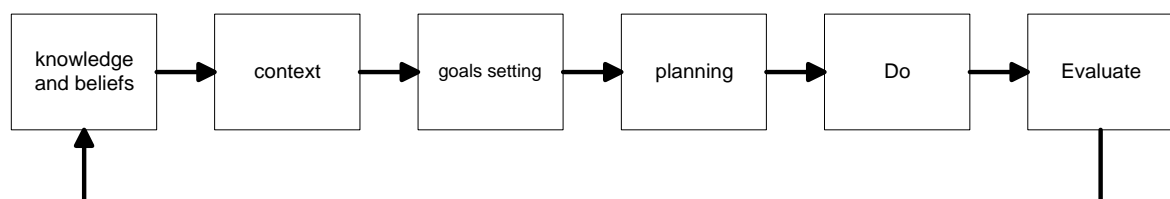
The work of Loucks-Horsley et al. (1998, p.2) also provides processes in considering a framework for designing ICT professional development for teachers. Based on their work, we identify six main steps (Figure 5.1) constituting the design of professional development:

1. Knowledge and beliefs leading to the vision and standards;
2. Context: teachers' and students' learning, curriculum, organization culture, and

existing practices of professional development;

3. Goals setting;
4. Planning: develop appropriate strategies to achieve the goals;
5. Do;
6. Evaluate

1. Knowledge and Beliefs in Professional Development

Loucks-Horsley et al. (1998) further identify four distinct but related knowledge bases for designing professional development:

1. How students learn;
2. How teachers teach;
3. Nature of school education; and
4. Principles of effective professional development.

How Students Learn

The main purpose of teachers' PD is to foster students' learning. Based on this fundamental understanding, the following points about student learning should be recognized.

- Knowledge is developed on the basis of students' prior knowledge.
- Effective learning is realized through active process instead of passive acceptance of information.
- Knowledge construction is a refining process of crude information.
- New knowledge is derived from observations of phenomena and input of ideas.
- Effective learning should be situated in relevant contexts.

How Teachers Teach

In school, teaching is the primary process to make learning happen. In this connection, teachers should acquire different pedagogical practices leading to meaningful and innovative learning. The following few points should be considered as important guidelines for effective teaching.

- The primary principle of teaching is to foster learning.
- Specific knowledge, such as solid subject knowledge, innovative pedagogical practices, etc., is required for teaching

The Nature of School Education

40

To a certain extend, teaching and learning, as discussed above, are general descriptions of school education. In order to make teaching and learning happen, we should take the nature of school education into serious consideration. Without the understanding, it is impossible to use ICT to create innovative pedagogical practices. Note the following key points.

- Leading by the rapid development of new technology, concepts and ideas of different subjects are continuously under challenges and the understanding of learning and teaching is constantly changing
- The inquiry process is the main characteristic and practice of pedagogy.

Principles of Effective Professional Development

Based on the discussion of learning and teaching, we would like to propose five important actions for making an effective PD of educational technology for teachers.

- Provide teachers with the necessary skills and knowledge for using ICT to deliver content knowledge with innovative pedagogical practices.
- Teachers should become learners in the sense that it is important for the teachers to understand the situation of their students' learning.
- Encourage teachers to collaborate with colleagues and other experts to improve their teaching practices.
- Build connections and provide links among the various parts of the education system.
- Design PD based on research findings of student learning, and continuously evaluate and improve these researches.

The knowledge bases discussed above provide important guidance to the design of professional development schemes. Course developers should familiarize themselves with these knowledge bases, and turn them into visions and designs of professional development of ICT for teachers.

Technological Pedagogical Content Knowledge

In his article entitled "Those Who Understand: Knowledge Growth in Teaching", Shulman (1986) advanced the concept of Pedagogical Content Knowledge (PCK). PCK is the intersection of content knowledge and pedagogy. It suggests a conceptualization of going beyond a simple thinking of content and pedagogy in isolation. PCK represents the blending of pedagogy and content, which provides an understanding of how particular aspects of subject matter are organized, adapted, and

represented for teaching and learning. In doing so, teachers must know how to introduce the teaching of subjects and how to conclude specific teaching. Every discipline and every component of every discipline has particular PCK associated with it. Building on the formulation of PCK, Mishra and Koehler (2006) argue that thoughtful pedagogical uses of technology require the development of a complex, situated form of knowledge that they called Technological Pedagogical Content Knowledge (TPCK). In doing so, they posit the complex roles of, and interplay among, three major components of learning environments, namely, content, pedagogy, and technology.

2. The Context of Professional Development

In the initial stage of design, we should be aware of the context that could affect the implementation of professional development. In setting the goals for professional development, first of all, the development of organization culture should be considered. Besides that, teacher collaboration is another important issue. In order to explain how these contextual issues in professional development, it is necessary to discuss the important contextual issues. In fact, these issues are inter-related, namely, community of practice, continuous professional development, learning organization, and fostering a professional culture and school change.

Community of Practice

Culture and professional development are inter-related because professional development activities contribute to a culture of collegiality, critical inquiry, and continuous improvement; whereas the school culture stimulates ongoing professional development (Hord and Boyd, 1995).

A community of practice (CoP) is a special type of informal network that emerges from a desire to work more effectively or to understand work more deeply among members of a particular specialty or work group. At the simplest level, CoPs are small groups of people who've worked together over a period of time and through extensive communication have developed a common sense of purpose and a desire to share work-related knowledge and experience (Sharp, 1997).

Regarding the shortcomings of the traditional approach of professional development, we suggest that the ideas of community of practice and learning organization should be taken into consideration for the development of the new PD model for educational technology of teachers.

According to Wenger (1998), members of a community are brought together by joining in common activities and by what they have learned through their mutual engagement in these activities. Applying this concept to education, members of a school, including students, teachers and the principal, form a community.

The ideas of CoP could be further elaborated as: "The fact that they are organizing around some particular area of knowledge and activity gives members a sense of joint enterprise and identity. For a community of practice to function it needs to generate and appropriate a shared repertoire of ideas, commitments and memories. […] In other words, it involves practice: ways of doing and approaching things that are shared to some significant extent among members" (Smith, 2004).

Continuous Professional Development

We find that the concept of community of practice is closely related to the guiding principles and beliefs of the continuous professional development (CPD) of teachers, which are stated as follows (ACTEQ, 2003; p. 7):

- as professionals, teachers should be well-equipped with subject and pedagogical knowledge, professional skills and supporting attitudes and values;
- teachers have a responsibility to be professionally up to date and to strive for continuous personal growth and professional excellence through lifelong learning;
- teachers as professionals also have a responsibility to facilitate the professional growth and development of their colleagues;
- individual teachers can choose to specialize or excel in particular dimensions of schoolwork as they grow in professional maturity;
- schools should be developed as professional learning communities, teachers' professional development should be regarded as an important force in school development;
- different schools may like to develop distinctive versions of the teacher competencies framework (TCF) appropriate to their philosophies and circumstances.

Learning Organization

To implement the guiding principles and beliefs of the continuous professional development (CPD) of teachers, a school community should grow to become a learning organization. The learning organization (Watkins & Marsick, 1993; p. 8) learns continuously and transforms itself. Learning occurs in individuals, teams and

organizations, and even the communities within which the organization interacts. Hence, a learning organization (Kerka, 1995) promotes a culture of learning, a community of learning.

Change, learning, and adaptation have all been used to refer to the process by which organizations adjust to their environment (Fiol & Lyles, 1985). Lorange (1996) argues that both at individual and organizational levels, learning has to be inspired by change and rapid change leads to strong pressure to learn. In contrast, Fiol and Lyles (1985) clarifies the distinction between organizational learning and organizational adaptation and argues that change does not necessarily imply learning and there are different levels of learning occurred in organizations. Learning is "the development of insights, knowledge, and associations between past actions, the effectiveness of those actions and future actions", whereas adaptation is "the ability to make incremental adjustments as a result of environmental changes, goal structure changes, or other changes" (Fiol & Lyles, 1985; p. 811).

In any effort to foster schools that learn, changes will make a difference only if they take place at all three nested systems, namely the classroom, the school, and the community. These interdependent systems are deeply embedded in daily life with interwoven patterns of influence (Senge et al., 2000). The three prime components of the learning classroom are teachers, students, and parents. The learning school provides an organizational infrastructure to sustain classroom activities, which involves active players such as superintendents, principals, school leaders, and school board members. The learning community, the most complex level, is the learning environment within the school operates, which involves influences draw from the character of local, regional, and international community. Furthermore, every organization is a product of how its members think and interact. Senge et al. (2000) further illustrates: "changing the way we think means continually shifting our point of orientation", and "changing the way we interact means re-designing not just the formal structures of the organization, but the hard-to-see patterns of relationships among people and other aspects of the system, including the systems of knowledge" (p. 20). Thus, the case analysis presented in this study focuses on how principals, teachers, and students think and interact in the processes of initiating and implementing pedagogical innovations.

Fostering a Professional Culture and School Change

Based on the concepts described above, it is imperative for us to discuss the building of professional culture. Strong professional learning cultures are vital to school improvement and raising student achievement. It is critical that teachers be equipped

with knowledge and skills that enable them to build and sustain performance-oriented cultures. School programs and policies should support teachers' professional growth; empower them to make instructional decisions to improve student achievement; and allow time for them to meet, plan, and reflect on practice (Bobbett, 2002).

In recent years, a culture of CPD has been thriving among principals and teachers in Hong Kong. Nevertheless, a number of studies have found a disjoint between calls for reform and actual educational practice. This is due, in part, to the lack of effective models to support professional development of teachers and principals.

Professional development models cannot simply be imposed, rather, we must create environments that provide teachers and principals with ongoing support for change that are situated in and address their practical needs. Teachers and principals need to have the opportunities to participate in discussion, reflection, and action that promote curriculum innovation as well as idea exchange for generating new ways of pedagogical practices using ICT.

To sustain and transfer the SITES M2 experiences to assist Hong Kong schools to carry out innovations, professional development program with the focus of school curriculum innovations should be provided to professionals working at various levels in schools, including principals, curriculum developers, IT-coordinators and subject teachers. Thus, it is important to develop a multi-level professional development model and to implement a scalable and sustainable on-line professional development program which enables school professionals to undertake curriculum innovations in their workplaces.

3. Towards a Framework for Designing Content of Professional Development

We have discussed the importance of teacher knowledge and beliefs and context of professional development. In this part, a framework for designing the content of teacher professional development (what teachers learn) in educational technology is described. Based on the review of relevant literature, the framework is grounded on the consideration of the following aspects:

- Professional development needs be geared towards subject-based and pedagogical use of ICT in classroom practices, and three major components of learning environments include content, pedagogy, and technology (Mishra & Koehler, 2006)
- Knowing and learning are situated in physical and social contexts (Putnam &

Borko, 2000)

- Using ICT in learning and teaching as pedagogical innovations (Fishman et al., 2004)
- Using ICT to promote school change (Preston, 2004)
- Teacher knowledge, beliefs, attitudes, and experience are important (Loucks-Horsley et al., 1998)
- The context of teacher professional development, including teachers' and students' learning, curriculum, organization culture, and existing practices of professional development (Loucks-Horsley et al., 1998; Fishman et al., 2001)

The framework for designing the content of teacher professional development in educational technology includes the following four dimensions:

- Technical content teachers must know that actually comprises ICT-supported classroom instruction
- Content teachers need to understand in order to prepare for the integration of ICT into learning and teaching
- Content teachers need to understand in order to build school ICT capacity and promote systemic change in learning and teaching
- Content of the social, ethical, legal, and human issues surrounding the use of ICT in schools teachers need to be aware

Technical content teachers must know that actually comprises ICT-supported classroom instruction

Fadel & Lemke (2006) identified a range of current technologies used in schools (ICT-supported classroom instruction), namely, television or video, calculators or graphing calculators, engagement devices, portable ICT devices, virtual learning, in-school computer use, and 1:1 computing. In SITES M2, a range of pedagogical practices using ICT were also found (Kozma, 2003). The planning of ICT PD for teachers should provide opportunities for teachers to build their curriculum content as well as pedagogical knowledge and technical skills. This would help teachers to examine their practices critically and develop in-depth understanding of their technical as well as pedagogical knowledge (Table 3.3). This would help teachers in choosing learning resources and integrating curriculum with technology.

We label this dimension as "technical knowledge", i.e. Teachers demonstrate appropriate technical competence in ICT operations and concepts. Teachers:
- understand the emerging ICT knowledge and skills,
- keep abreast of current development of ICT in education,

- use ICT to enhance professional practice and increase productivity, and
- evaluate and reflect on professional development regarding the pedagogical use of ICT.

Content teachers need to understand in order to prepare for the integration of ICT into learning and teaching

Teachers need to understand KLA-specific as well as level-specific pedagogical integration using ICT. One important aspect is to understand the new learning environments enabled by ICT. The following is an example of new learning environments in contrast to traditional learning environments.

Table 3.1: Traditional and New Learning Environments (ISTE, 2000, p.5)

Traditional Learning Environments	New Learning Environments
Teacher-centred instruction	Student-centred instruction
Single-sense stimulation	Multi-sensory stimulation
Single-path progression	Multi-path progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive learning	Active/explanatory/inquiry-based learning
Factual, knowledge-based learning	Critical thinking and informed decision-making
Reactive response	Proactive/planned action
Isolated, artificial context	Authentic, real-world context

It shows a general shift from teacher-centred to student-centred learning approach. The impact of ICT in education is not restricted to the introduction of technology in learning. Instead, it facilitates the emergence of new learning approaches. Thus, planning ICT PD for teachers needs to emphasize the conception of "design of new learning environments" in relation to pedagogical practices at different levels (primary and secondary) within different KLAs.

The effective use of ICT by teachers is closely related to their students' ICT competencies, information literacy (EMB, 2005b), and generic skills as specified in the curriculum reform document (CDC, 2000). The design of PD for teachers should be linked to student learning. Thus, teachers need to understand the notions of information literacy and generic skills in relation to ICT and KLAs. The following table (Law & Plomp, 2003; p. 20) presents an overview of pedagogy change in the information age.

Table 3.2 Overview of Pedagogy in the Industrial versus the Information Society

Aspect	Less ("traditional pedagogy")	More("emerging pedagogy" for the Information Society)
Active	Activities prescribed by teacher	Activities determined by learners
	Whole class instruction	Small groups
	Little variation in activities	Many different activities
	Pace determined by the program	Pace determined by learners
Collaborative	Individual	Working in terms
	Homogeneous groups	Heterogeneous groups
	Everyone for him/herself	Supporting each other
Creative	Reproductive learning	Productive learning
	Apply known solutions to problems	Find new solutions to problems
Integrative	No link between theory and practice	Integrating theory and practice
	Separate subjects	Relations between subjects
	Discipline-based	Thematic
	Individual teachers	Terms of teachers
Evaluative	Teacher-directed	Student-directed
	Summative	Diagnostic

A range of learning types using ICT emerges in educational technology research and studies (Fadel & Lemke, 2006; Kozma, 2003). However, the existing common assessment methods only serve for traditional learning environments. For this reason, planning ICT PD for teachers should take into account of the issues of assessment and evaluation, in particular new forms in assessing student learning using ICT.

We label this dimension as "pedagogical integration", i.e. Teachers plan and design effective subject-specific as well as level-specific pedagogical integration using ICT. Teachers:

- understand the learner-centred learning environments enabled by ICT in pedagogical practices and innovations,
- design appropriate learning experiences that facilitate pedagogical practices using ICT,
- apply ICT in learning and teaching to facilitate the development of student information literacy skills (EMB, 2005) and generic skills (CDC, 2000), and
- apply ICT with multiple assessment methods in assessing student learning.

Content teachers need to understand in order to build school ICT capacity and promote systemic change in learning and teaching

Finally, the planning of PD for teachers should support teachers to serve in leadership roles, for example, as supporters of other teachers, as agents of change, and as

promoters of teaching with ICT.

Table 3.3 The Range of Roles Played by Teachers as Observed in Some Case Studies
of Innovative Pedagogical Practices Using Technology (Law & Plomp, 2003; p. 24)

Level of deviation from the traditional	Roles played by the teacher
Traditional	Present and explain information and concepts
	Set instructional tasks for students
	Monitor student progress and assess students' performance
Some new elements	Provide feedback to students
	Develop teaching materials
	Design curriculum and learning activities
Emergent	Select ICT tools for use in the various learning activities
	Co-teaching with other teachers
Innovative	Support and model the actual enquiry process for students
	Liaise with parties outside of the school who may have various levels of involvement in the learning/teaching process
Most innovative	Support the team building and collaborative process of students
	Mediate communications between students and experts

We label this dimension as "managing and leading ICT", i.e. Teachers demonstrate understanding of managing and leading ICT implementation in schools. Teachers:

● participate in making decision on hardware, software, and administrative systems,

● participate as a team member to build school ICT capacity and promote systemic change in learning and teaching, and

● engage in strategic planning in ICT implementation

Content of the social, ethical, legal, and human issues surrounding the use of ICT in schools teachers need to be aware

Finally, teachers need to be aware of the social, ethical, legal, and human issues surrounding the use of ICT in classroom, school, and outside school. We label this dimension as "socio-cultural awareness", i.e. Teachers are aware of the social, ethical, legal, and human issues surrounding the use of ICT in schools and demonstrate those principles in practice. Teachers:

● educate students with social capability to function positively in the digital culture,

● model and teach legal and ethical practice related to ICT use,

● promote safe and healthy use of ICT resources, and

● facilitate equitable access to ICT resources for all students

Summary

"Teacher educators have long struggled to define what teachers should know" (Putnam & Borko, 2000; p. 12). In this section, we attempt to propose a framework for designing the content which is appropriate to teacher ICT professional development. The proposed framework can be summarized in the following four dimensions:

A. Technical knowledge
Teachers demonstrate appropriate technical competence in ICT operations and concepts. Teachers:

1. understand the emerging ICT knowledge and skills,
2. keep abreast of current development of ICT in education, and
3. use ICT to enhance professional practice and increase productivity

B. Pedagogical integration
Teachers plan and design effective subject-specific as well as level-specific pedagogical integration using ICT. Teachers:

1. understand the learner-centred learning environments enabled by ICT in pedagogical practices and innovations,
2. design appropriate learning experiences that facilitate pedagogical practices using ICT,
3. apply ICT in learning and teaching to facilitate the development of student information literacy skills (EMB, 2005) and generic skills (CDC, 2000), and
4. apply ICT with multiple assessment methods in assessing student learning

C. Managing and leading ICT
Teachers demonstrate understanding of managing and leading ICT implementation in schools. Teachers:

1. participate in making decision on hardware, software, and administrative systems,
2. participate as a team member to build school ICT capacity and promote systemic change in learning and teaching,
3. engage in strategic planning in ICT implementation,
4. evaluate and reflect on professional development regarding the pedagogical use of ICT, and
5. understand the policies on ICT in education at school and system level

D. Socio-cultural awareness

Teachers are aware of the social, ethical, legal, and human issues surrounding the use of ICT in schools and demonstrate those principles in practice. Teachers:

1. educate students with social capability to function positively in the digital culture,
2. model and teach legal and ethical practice related to ICT use,
3. promote safe and healthy use of ICT resources, and
4. facilitate equitable access to ICT resources for all students

Illustrations of the Proposed Framework

The above framework with four dimensions is proposed. We argue that the design of learning activities for teachers, such as training courses, workshops, conferences, online courses, forming teacher CoP … etc., should consider certain aspects of these dimensions. The dimensions and indicators can be used as content descriptors in designing professional development courses for teachers. The following illustrations are taken from the design of pilot courses for Primary General Studies teachers and Secondary Liberal Studies teachers in the current project (ref: Part 7).

Illustration 1

Module Title: Information Literacy and Project-based Learning
Synopsis: Project-based learning (PBL) is a widely adopted pedagogy in school education. By exploring the conduction of the various stages of PBL, it will facilitate teachers' understanding on the implementation of Information Literacy (IL) in conducting PBL. Through appropriate arranged discussion sessions, teachers will be guided to understand the learning standards within the cognitive, meta-cognitive, affective and socio-cultural dimensions of IL in this process.
Target participants: Primary General Studies teachers
Duration: 3 hours
Content descriptors: B1, B2, B3, D1, D2

Illustration 2

Module Title: Computer-Supported Collaborative Learning
Synopsis: Collaborative learning is the pedagogy for advocating learning in groups. By exploring various latest technologies in information processing, visual representation and communication for collaborative learning, it will facilitate an understanding of using information technology for facilitating the collaborative learning process.
Target participants: Primary General Studies teachers

Duration: 3 hours
Content descriptors: A1, B1, B2, B3

Illustration 3

Module Title: The Role of Pedagogy in Using Technology for Teaching and Learning
Synopsis: Teachers are encouraged to use resources in digital world for effective teaching and learning of a subject such as General Studies. This module provides opportunities for participants to understand the role of pedagogy in using technology for teaching and learning in the digital world.
Target participants: Primary General Studies teachers
Duration: 3 hours
Content descriptors: A1, A2, B2

Illustration 4

Module Title: The Role of Pedagogy in Using Technology for Teaching and Learning: School Experiences
Synopsis: There are schools designing pedagogy in using technology for teaching and learning in their daily teaching and learning activities for the school curricular. By visiting this school, it will facilitate teachers' understanding of the key issues of designing appropriate pedagogy in using technology in daily teaching and learning activities of school education.
Target participants: Primary General Studies teachers
Duration: 3 hours
Content descriptors: B1, C2, C4

Illustration 5

Module Title: Graphic Organizers
Synopsis: Graphic organizer is a software tool that supports the theories of visual learning such as dual coding theory, schema theory and cognitive load theory. Graphic organizer utilizes graphical ways of teaching and learning that help students make abstract ideas concrete and connect prior knowledge and new concepts. It provides structure for thinking, writing, discussing, analyzing and planning. Graphic organizer with contents that are specific to Liberal Studies is certainly a help to illustrate the above rationales.
Target participants: Secondary Liberal Studies teachers
Duration: 3 hours
Content descriptors: A1, B2, B3

Illustration 6

Module Title: WebQuest and IES in Liberal Studies

Synopsis: WebQuest is a Web-based learning model providing inquiry-oriented activity in which some of the information that students interact with the Internet. Through activities on filtering, classifying, processing, analyzing, synthesizing or evaluating the Web information pre-selected by teachers, students can complete the assigned tasks in the WebQuest. This model is in line with the objectives specified by IES in Liberal Studies.

Target participants: Secondary Liberal Studies teachers

Duration: 3 hours

Content descriptors: A2, B3, B4

Illustration 7

Module Title: Information Literacy (IL) in Liberal Studies

Synopsis: Liberal Studies teachers are encouraged or cannot avoid using the learning materials from the Web. By exploring various case studies on teaching and learning activities in Liberal Studies teaching, it will facilitate an understanding of the pedagogy of developing Information Literacy in school curricula.

Target participants: Secondary Liberal Studies teachers

Duration: 3 hours

Content descriptors: B3, D2

Illustration 8

Module Title: WebQuest and Information Literacy: A School Implementation

Synopsis: Experienced teachers are expected to have the capacity to innovate the learning and teaching processes from the Community of Practice (CoP) perspective. There are schools implementing WebQuest and information literacy in their teaching and learning activities in the school curricular. By visiting this/these school(s), it will facilitate participants' understanding of the implementation strategies and difficulties encountered as well as the roles of WebQuest and Information Literacy in the development of the subject curricula.

Target participants: Secondary Liberal Studies teachers

Duration: 3 hours

Content descriptors: B1, C2, C4

Part 6: Models for Teacher Professional Development

Introduction

The notion of professional development has been evolving in the past two decades. The operational definition proposed and adopted by (Grant, 1996; Wells, 2007) states that professional development should go beyond the narrow meaning of "training". Professional development should encompass learning skills, formal and informal means of helping teachers not only learn new skills, but also develop new insights into pedagogy and their own practice, and explore new or advanced understandings of content and resources. This definition, as elaborated in (Wells, 2007), includes support for teachers as they encounter the challenges that come with putting into practice their evolving understandings about the use of technology to support inquiry-based learning. In short, professional development can be conceived as a vehicle to facilitate teacher to become a reflective practitioner who constantly engages him/herself in improving or reconceptualising their own practices.

However, in traditional training models, teachers are often being placed in a de-contextualised environment where they are taught to use new technologies and to solve problems which have little relevance and no connection to their practices (Fullan & Steigelbauer, 1991; Grant, 1996; Guskey, 2003; Hasselbring et al., 2000; Kennedy, 1998; S. C. Li, 2007; S. C. Li et al., 2000; Little, 1994; Loucks-Horsley & Matsumoto, 1999; Mullens, Leighton, Laguarda, & O'Brien, 1996; Wenglinsky, 2002). (Mouza, 2002) pointed out that the sit-and-get training sessions without on-going support have not been effective in promoting changes in teachers' practices.

To realise the notion of professional development as espoused above, (CERI, 1998; Wells, 2007) argues that effective professional development should possess six key defining features: (1) experiential, engaging teachers in concrete tasks that illuminate the process of learning and development; (2) rooted in inquiry, reflection, and experimentation that are participant-driven; (3) collaborative and interactive, involving a sharing of knowledge among educators and a focus on teachers' communities of practice with support from both inside and outside of setting; (4) connected to and derived from teachers' work with their students (Hawley & Valli, 1999); (5) sustained, on-going and intensive, supported by modelling coaching and

collective problem solving around specific problems of practice; and (6) connected to other aspects of school change integrated with a comprehensive change process.

Possible models for teacher professional development

According to the findings derived from the interviews conducted in this study, it is evident that the professional development should be non-mandatory in a way that teachers are free to determine the types of TPD and the corresponding modes of delivery wherever suit their needs. It is anticipated that the TPD on information and technology literacy should be anchored onto the CPD framework in which teachers can allocate the stipulated CPD hours to subscribe to relevant trainings and professional development programmes. In terms of the modes of the teacher professional development, they can be conceptualized into three levels of delivery: System-Wide Approach; School-based Approach; and School clustering Approach.

System-wide Approach (SWA)

The system-wide approach generally comprises of the Cascade Model, FAN Model and the Train-the-Trainer Model (S. C. Li, 2007; MOE, 2004). In these models, a number of professional development providers are identified and certified as qualified training providers to school after receiving a certain amount of training. These providers then provide either off-site or on-site training to schools. While these models of training are able to ensure a certain degree of standardisation of content and to induce a cascade effect within a very short period of time, these kinds of training have been criticized for lacking relevancy to learning and teaching and failing to address the individual school and classroom differences in terms of their practices.

School-based Approach (SBA)

The school-based approach can be related to the Mentor-Mentee Model and the Teacher Leadership Model, etc. There has been a huge body of research studies (Darling-Hammond & Maclaughlin, 1995; S. C. Li, 2007; Powell, Goldenberg, & Cano, 1995; Saunders, Goldenberg, & Hamann, 1992) indicate that effective professional development settings have been found to be sustained, on-going, and site-based and allow teachers to talk with peers about changes and improvement in their practices. These settings should foster collaboration among teachers and engage them as both learners and experts in a collegial and supportive environment. The

instructional experts serve as coaches formally or informally to providing modelling and feedbacks to their colleagues. In comparison to the Cascade Model and the Train-the-Trainer Model, this school-based approach is able to connect the professional training with more authentic situations in which innovations and new ideas can be implemented and better contextualized into the real practices. To realize these goals, leadership training programmes at different levels are deemed to be necessary. To sustain school change and development, it is a matter of culture and capacity building among teachers within the school. To ensure the new practices to take root in school, it is more desirable to get together a small team of teachers, comprising school curriculum leaders, panel chairs and subject teachers, involved in the same professional development programme. The focus of the programmes not only centres on the new practices alone, but also takes into consideration of all the contextual factors conducive to the successful implementation of the initiatives. This holistic approach will avoid teachers working in isolation after exiting the formal training and thus enhancing the sustainability of teacher professional development and the school development.

School-clustering Approach (SCA)

The basic notion of the school-clustering approach (S. C. Li, 2007; Schlager, J., & Schank, 1999; Wenger, 1996) resembles the notion of school-based approach discussed above. While both approaches focus on cultural and community building, the school-clustering approach put more emphases on sharing and collaboration among schools. Building, maintaining and expanding a community of practice for teachers is the key for mediating transformative, sustainable and scaleable teacher professional development and for extending the scope of teacher training to become a more integral part of a teacher's career. A community of practice for professional development is bound by a common sense of purpose and the need to know what each other knows. (Garet et al., 2001; Killion, 1998) noted that collective participation of teachers from the same school, grade or level, or subject will develop greater momentum for change. Collaboration per se does not appear to guarantee improved achievement(Fullan & Hargreaves, 1996), but if teachers involved share common goals and common problems, collegial collaboration could facilitate teachers to reflect upon and improve their own practices (Loucks-Horsley & Matsumoto, 1999). In the school-clustering approach, it is anticipated that teams of teachers from neighbourhood schools, with common expectations, goals, problems or projects, can come together to work out the solutions for their schools through action learning. This kind of professional development provides the opportunity for teachers to expose to a

variety of educational settings and the issues concerning implementation of the new practices. To ensure sufficient amount of time is allocated to each team to implement the new practices in their school concerned, the duration of the professional development programme should span over a longer period of time from a few months to one or two academic years, and the programme should entail the provision of consultancy from the training providers when necessary.

TPD Implementation

TPD and Managing Change

The challenge one envisages in designing IT professional development is far bigger than designing other teacher professional development. For a variety of reasons, as (Schrum, 1999) argued, it makes many IT professional development programmes less effective than other TPD programmes. First of all, to effect a change in integrating IT into teachers' practices, the teachers involved should be well aware of their pedagogical needs as well as the pedagogical implications of those emerging technologies. Though it is generally agreed that teachers should focus on the IT pedagogical design (S. C. Li, 2007; S.C. Li et al., 2006) rather than the technology per se, to effectively use of technologies for the enhancement of learning and teaching, teachers should, at least, have an understanding of the opportunities and solutions that technology can provide for their classrooms. On the other hand, most of the ubiquitous technologies that have impact on education, such as, search engines, discussion forums, weblogs (S. C. Li, 2007; Lui, Choy, Cheung, & Li, 2006) etc., were not designed intentionally for learning and teaching. To provide students with new learning experience through technology, it demands teachers to have insights into pedagogical strategies and sensitivity towards emerging technologies. As technology is ever-changing, the life-cycle of new technology has been shortening. Thus, crystalising experience learned from experimentation of new practices thus becomes difficult. To effect and sustain change in teachers' practices, the modes of delivery of TPD programmes should therefore be designed in a way that caters for the needs emerging at different stages of managing curriculum and pedagogical innovations in school (Fullan, 1995; Fung, 1995; Gardner, 2004; S. C. Li, 2007): Stage 1 - Awareness (of pedagogical needs and pedagogical implications of emerging technologies); Stage 2 - Conceptualization; Stage 3 - Implementation; Stage 4 - Evaluation & Reflection, and Stage 5 - Dissemination. Different stages of managing pedagogical innovations can be associated with different models of TPD implementation (see Table 2).

Table 2: Models of TPD and Key stages of Managing Pedagogical Innovations

Model of TPD	Activity	Content and Skills	Key Stages of Managing Pedagogical Innovations
System-wide	teacher conferences, workshops, seminars, short training courses, etc.	emerging practices; emerging technologies and its pedagogical implications; skills in supporting development of the infrastructure for learning and teaching, awareness of ICT policies etc.	Awareness; Conceptualization; Dissemination
School-based	workshops, seminars, experience-sharing sessions, training courses, etc.	subject-based pedagogies; technical-know-how training programmes; facilitating equitable access to ICT resources for all students; applying ICT with multiple assessment methods in assessing student learning etc.	Awareness; Conceptualization; Dissemination
School-clustering	action learning through implementation in individual cluster school; with mentoring support; with relatively long time span etc.	evolved from clustered schools; pedagogy-oriented; building school ICT capacity and promote systemic change in learning and teaching; designing appropriate learning experiences that facilitate pedagogical practices using ICT etc.	Awareness; Conceptualization; Implementation, Evaluation & Reflection; Dissemination

As espoused above, each type of model has its defining role and unique purposes in the entire process of managing change. While the system-wide models such as the "Train-the-Trainer" and "Four-Tier Fan" models (S. C. Li, 2007; MOE, 2004), are effective in providing large-scale standardised professional development to teachers, the school-clustering model is able to cater for teacher and school diversity through the provision of action learning experience for the participants. To sustain pedagogical innovations and to properly address the issue of school and teacher diversity, the provision of a wide spectrum of TPD with different modes of delivery is thus necessary.

School-Clustering in Action

As espoused above, the gist of the school-clustering approach are three fold: (1) to connect and integrate TPD directly into classroom practice; (2) to cater for teacher and school diversity by addressing the common interests or problems envisaged within each school clusters; and (3) to sustain change by immersing teachers into authentic environments where they can constantly reflect on their own practices through collaborative action learning. In this respect, schools that share similar areas of concern about learning and teaching should be encouraged to form clusters to work out appropriate measures for improving their practices. To address individual needs of each school cluster and enhance their ownership of the problem(s) or project(s) concerned, they should be required to submit a joint proposal with well-defined objectives, implementation procedure and mechanism for evaluation and reflection.

It can be seen that the notions of School-Clustering Approach resemble those of the Information Technology in Education Partnership Incentive Scheme (ITIS) (EMB, 2006)and Learning Centres (LC) (EMB, 2004) initiated by Education and Manpower Bureau. Nonetheless, the school-clustering approach and ITIS or LC differs from one and other in terms of their relatively different emphasis on the process and outcomes of the implementation. While LC and ITIS stress more on the deliverables such as the end-products and dissemination of 'good' practices to the wider community, SCA views the entire implementation process together with the deliverables, as vehicles to foster professional development for the teachers involved, facilitating them to reflect on and improve their practices on an on-going basis. To achieve this goal, it is necessary to ensure that appropriate professional support and guidance can be provided for the school clusters. Building on the success and experience derived from the implementation of ITIS and LC initiatives, there are a few considerations needed to be taken in order to enhance the effectiveness of school-clustering approach to TPD:

1. the partnership among clustered schools, professional bodies and teacher education institutes should be strengthened;

2. the role of these professional bodies or TEIs should migrate from being professional consultants to project leaders, involving in pedagogical design, technology integration, evaluation, assessment, reflection, etc. at different junctures and stages of the entire implementation;

3. the number of projects funded each year should be increased[1] to enlarge the size of beneficiaries so that a culture of capacity-building through action learning can be instilled within the community;

4. apart from purchasing equipments and technologies, it is desirable to ensure that a reasonable portion of funding awarded to each cluster should be allocated to relieving the workload of teachers who are participating in the project through the provision of teacher-secondment and supply-teachers.

Ecology and Incentives for TPD Implementation

Policy alignment

Findings derived from the focus-group discussions and in-depth interviews indicate that setting IT professional development non-mandatory and coupling of IT training hours with CPD hours was generally well received by teachers. Nonetheless, some respondents worried that, as most of the teachers (especially those from the secondary sector) have been profoundly engaged in training related to the New Secondary School curriculum, there will be little room for them to consider IT professional development. Thus, a genuine understanding of the ecology and dynamics of different education initiatives is pivotal to the success of TPD implementation (S. C. Li, 2007). In designing system-wide professional development programmes, it is necessary to ensure the alignment of the IT professional development with the wider curriculum reform. For instance, to void exhausting teacher's effort, some professional development programmes, such as those related to Information Literacy (IL) can be integrated with TPD for other subject or key learning areas, such as General Studies or Liberal Studies. As information collection, processing and synthesising are the essential elements required in teaching and learning of General Studies and Liberal Studies, it thus provides a rich context for the inception of information literacy. In addition, to motivate teachers to subscribe to system-wide professional development, it is desirable if some selected courses provided has credit bearing and can be articulated to master or higher degree programmes.

New currency for CPD

As discussed in previous sections, developing a community of practice and a collaborative culture is conducive to the sustainability of teacher professional development and school development. However, it is noteworthy that the emerging

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[1]20 projects were funded in the IT in Education Partnership Incentive Scheme during 2006-7

collaborative culture is being undermined by the rising competition among schools as a result of the declining student enrolment in recent years. Simply mandating teachers to complete a stipulated number of hours of CPD may not make any difference. To foster collaboration and experience sharing among teachers and schools, it is necessary to introduce a new 'currency' for CPD (S. C. Li, 2007). The idea is to encourage experience teachers and school clusters, with support from professional bodies or TEIs, to provide TPD services for the school community. Their contribution should be converted into a form of 'currency' or revenue that can be injected into their schools' professional development funds or individual teachers' professional development funds. This kind of development funds can be deployed to support schools and experienced teachers to further their own professional development. The introduction of this new 'currency' for CPD thus helps This new 'currency' for CPD helps provide incentives for collaboration and translate teachers' expertise into capitals which can be re-invested in their own professional development.

Part 7: Pilot Courses

The Joint Consultant Service Team (JCST) had investigated different approaches for professional development of in-service teachers. The development of the contents of professional development would base on the needs of school teachers on using information technology and knowledge of information literacy in teaching of the eight key learning areas and catering individual needs of teachers. In considering the resource constraint as well as the time span of this service, this pilot study focused the development of training materials on developing the competency of information and technology of teachers in the subject of General Studies in primary and Liberal Studies in secondary schools.

Two 12-hour professional development programmes were designed according to the provisional revamped training framework developed by this. Each pilot course consists of four 3-hour module to be held on two Saturday's. The aim was to test run part of the revamped framework for teachers. They were pilot courses and did not reflect the implementation strategies and all the contents of training modules in the final revamped training framework.

Guidelines on Course Design

The following initial guidelines were considered for implementing the two pilot courses:

(1) The design of the new framework should not ignore current teachers' achievements in BIT, IIT, UIT and AIT levels. The new framework is part of the teachers' continuous professional development with concentration on information technology, information literacy as well as the pedagogical integration;

(2) In our focus group interviews, it was quite a common viewpoint that technical skills and knowledge were not their concerns and professional development programmes should be based on classroom examples with strong pedagogical rationales and are geared to the subject contents; and

(3) Teachers aspire to authentic knowledge and practical experiences. From the perspective of Communities of Practice, teachers who are role models of learning are expected to have the capacity to innovate the learning and teaching

processes for their students and share their best practices (Huysman, Wenger, & Wulf, 2003; Wenger, 1998). Hence teachers' workplace learning experiences would be considered in the professional development programme.

Accordingly, all modules are extensions of current teachers' professional development in IT in education. Examples and practices are based on classroom experiences. There was at least one 3-hour module to be conducted by a team of teachers to share their teaching and learning experiences in using information and technology in their schools.

Pilot course for primary General Studies Teachers

Module Title
(1) Information Literacy and Project-based Learning (資訊素養與專題研習)

Synopsis
Project-based learning (PBL) is a widely adopted pedagogy in school education. By exploring the conduction of the various stages of PBL, it will facilitate teachers' understanding on the implementation of Information Literacy (IL) in conducting PBL. Through appropriate arranged discussion sessions, teachers will be guided to understand the learning standards within the cognitive, meta-cognitive, affective and socio-cultural dimensions of IL in this process.

Course Evaluation and Teacher's Reflection
The course was well-received and teachers contended that they would implement what they had learned in their classrooms. Some teachers held that the contents were also suitable for library classes. Some suggested that it would be much better if they had the pre-class reading materials.

Module Title
(2) Computer-Supported Collaborative Learning (合作學習與資訊科技)

Synopsis
Collaborative learning is the pedagogy for advocating learning in groups. By exploring various latest technologies in information processing, visual representation and communication for collaborative learning, it will facilitate an understanding of using information technology for facilitating the collaborative learning process.

Course Evaluation and Teacher's Reflection

Teachers felt that contents were excellent but it needed more time to cover.

Module Title

(3) The Role of Pedagogy in Using Technology for Teaching and Learning
    (教學法在應用科技於教學的角色)

Synopsis

Teachers are encouraged to use resources in digital world for effective teaching and learning of a subject such as General Studies. This module provides opportunities for participants to understand the role of pedagogy in using technology for teaching and learning in the digital world.

Course Evaluation and Teacher's Reflection

This course stimulated teachers' thinking about the future direction of using IT in teaching. Some expressed that they learned new concepts about the use of inquiry-based approach when applying IT in teaching. Some suggested there should be concrete examples, in the context of a KLA, to illustrate how to apply the pedagogy presented in the course.

Module Title

(4) The Role of Pedagogy in Using Technology for Teaching and Learning: School Experiences (教學法在應用科技於教學的角色：學校經驗分享)

Synopsis

There are schools designing pedagogy in using technology for teaching and learning in their daily teaching and learning activities for the school curricular. By visiting this school, it will facilitate teachers' understanding of the key issues of designing appropriate pedagogy in using technology in daily teaching and learning activities of school education.

Course Evaluation and Teacher's Reflection

The contents were heuristically presented. The instructional strategies introduced were practical. However, some teachers contended that it was unclear the technology can promote learning, not to mention that there was additional resource implication. They suggested that we should base on the existing technology that most schools had been equipped and explore the possibility of change of quality in learning.

Pilot course for Secondary Liberal Studies Teachers

Module Title

(1) Graphic Organizers

Synopsis

Graphic organizer is a software tool that supports the theories of visual learning such as dual coding theory, schema theory and cognitive load theory. Graphic organizer utilizes graphical ways of teaching and learning that help students make abstract ideas concrete and connect prior knowledge and new concepts. It provides structure for thinking, writing, discussing, analyzing and planning. Graphic organizer with contents that are specific to Liberal Studies is certainly a help to illustrate the above rationales.

Course Evaluation and Teacher's Reflection

The use of Inspiration 8 (http://www.inspiration.com) as a tool to organize ideas and concepts are well received by participants. The software tool can be keyed in Chinese characters. Hyperlinks can be embedded with other multimedia materials on each node. Participants are interested in the templates which frame thinking skills and serve as scaffolding strategy in enhancing their teaching skills in the issue-enquiry approach. Participants raised the questions whether EMB can provide support to them to get multimedia teaching resources and in school who takes up the responsibility to teach the software for their LS students. Whenever there is course on graphic organizers, participants suggested that there should be more LS specific examples to illustrate the teaching methods and that there should be more time in workshop or group work to construct a LS graphic organizer in class.

Module Title

(2) WebQuest and IES in Liberal Studies

Synopsis

WebQuest is a Web-based learning model providing inquiry-oriented activity in which some of the information that students interact with the Internet. Through activities on filtering, classifying, processing, analysing, synthesising or evaluating the Web information pre-selected by teachers, students can complete the assigned tasks in the WebQuest. This model is in line with the objectives specified by IES in Liberal Studies.

Course Evaluation and Teacher's Reflection

Though participants were interested in WebQuest an explorative self-learning strategy,

some did not agree the use WebQuest as a way to conduct IES in Liberal Studies since the format of WebQuest might limit the scope of IES. Some held that it will be a burden to teachers to deal with assignments in electronic format. Some participants were interested in the teaching strategy derived from the ZPD (Zone of Proximal Development) theory. Providing scaffolding shown in the process of the WebQuest was a good way to guide their student to complete an ILS in Liberal Studies.

Module Title
(3) Information Literacy (IL) in Liberal Studies

Synopsis
Liberal Studies teachers are encouraged or cannot avoid using the learning materials from the Web. By exploring various case studies on teaching and learning activities in Liberal Studies teaching, it will facilitate an understanding of the pedagogy of developing Information Literacy in school curricula.

Course Evaluation and Teacher's Reflection
Participants had different understandings about the scope and significance in student learning. They were particularly interested in the copyright and the plagiarism issues. There were hot discussions about students' searching resources on Internet, evaluating information on Websites and an IL Website in an Australian university. Teachers raised the concerns (1) how to transform the abstract IL concepts into their daily practice in teaching; (2) how to permeate the ideas of IL into different KLA; and (3) how to teach LS students the citation format especially in Chinese when writing LS essay assignments. Teachers expressed the view that they need more teaching materials about IL.

Module Title
(4) WebQuest and Information Literacy: A School Implementation

Synopsis
Experienced teachers are expected to have the capacity to innovate the learning and teaching processes from the Community of Practice (CoP) perspective. There are schools implementing WebQuest and information literacy in their teaching and learning activities in the school curricular. By visiting this/these school(s), it will facilitate participants' understanding of the implementation strategies and difficulties encountered as well as the roles of WebQuest and Information Literacy in the development of the subject curricula.

Course Evaluation and Teacher's Reflection

The invited school gave a very interesting sharing about their implementations of WebQuest and IL in their school. The speakers suggested the adoption of a group approach in order to achieve a successful use of IT in teaching. A single person was unable to promote any innovative ideas on the use of IT in classrooms. Some participants asked for one more school to participate the sharing session.

Conclusion

Previous EMB teacher training courses were usually carried out by means short-term courses. Each event of courses provided one or two places for teachers in one school. Teachers were then expected to bring their knowledge to be implemented in their classrooms. However, when they returned to school, they found that they were working alone and isolated from their classmates of the course, without further communications or community for resource sharing, implementation experience sharing and peer support. Thus, it is highly recommended that in the future professional teaching courses there should be more places offer to one school so that they can set up peer support groups to implement what they have acquired in the training courses. In the ideal case, teachers from various schools can form a community of practice to share and advance their knowledge about a particular application or pedagogy in using IT in teaching and learning.

In all modules conducted, teachers expressed unanimously that there should be more content/KLA specific materials and teaching exemplars. Also, workshops and group discussions are critical components in any teacher training course since experience sharing can enforce their beliefs and improve their practice of use of IT in classrooms.

Part 8: Recommendations

1. Teacher ICT professional development should interweave the notions of information literacy (IL) and ICT in education, so that teachers could facilitate and develop their students to become information literate and function in the new world economy.

2. ICT professional development for teachers should provide the necessary knowledge and competence that will help teachers analyse and reflect on environmental changes and develop appropriate strategies to make continuous improvement and development in their teaching practices. The design of professional development content should include the dimensions described in the proposed framework, namely, technical knowledge, pedagogical integration, managing and leading ICT, and socio-cultural awareness.

3. The proposed framework should serve as content descriptors to identify teacher ICT professional development needs that teachers are required for successful pedagogical integration in the changing environment.

4. The proposed framework should be appropriate for both primary and secondary teacher professional development, despite the pedagogical integration needs particular consideration in different classroom contexts.

5. To ensure teachers to possess the capacity of employing or developing appropriate pedagogies to enhance student learning through ICT, the teacher ICT competence espoused in the proposed framework should be stipulated as part of the desirable learning outcomes in both pre-service and in-service teacher education programmes.

6. To effect changes in teachers' practices, different modes of delivery of TPD programmes such as System-wide, School-based and School-clustering approaches should be employed to address the needs emerging at different stages of managing curriculum and pedagogical innovations in school.

7. To sustain pedagogical innovations and to properly address the issue of school and teacher diversity, it is necessary to put more emphasis and resources on promoting the formation of school clusters through which teachers can immerse

themselves into an authentic environment where they can constantly reflect on their own practices through collaborative action learning.

8. The partnership among clustered schools, tertiary institutes and other professional bodies should be strengthened. The role of TEIs and these professional bodies should migrate from being professional consultants to active participants, leading the pedagogical design, technology integration, evaluation, assessment, reflection, etc. at different junctures and stages of the entire implementation.

9. The number of 'school-clustering' projects funded each year should be increased to enlarge the size of beneficiaries so that a culture of capacity-building through action learning can be instilled within the community.

10. To ensure sufficient amount of time is allocated to each cluster to implement the new practices in their schools concerned, the duration of the professional development programme through the school-clustering approach should span over a longer period of time from a few months to one or two academic years.

11. Apart from purchasing equipments and technologies, it is desirable to ensure that a reasonable portion of funding awarded to each cluster should be allocated to relieving the workload of teachers who are participating in the collaborative project through the provision of teacher-secondment and supply teachers.

12. At school level, a mechanism should be in place in school to facilitate teachers and administrators and curriculum leaders to plan, to evaluate and to reflect upon their ICT practices.

13. A genuine understanding of the ecology and dynamics of different education initiatives is pivotal to the success of TPD implementation. In designing system-wide professional development programmes, it is necessary to ensure the alignment of the IT professional development with the wider curriculum reform. For instance, to void exhausting teacher's effort, some professional development programmes, such as those related to Information Literacy (IL) can be integrated with TPD for other subject or key learning areas, such as General Studies or Liberal Studies. As information collection, processing and synthesising are the essential elements required in teaching and learning of General Studies and Liberal Studies, it thus provides a rich context for the inception of information literacy.

14. To foster collaboration and experience sharing among teachers and schools, it is necessary to introduce a new 'currency' for the teachers' Continuing Professional Development (CPD). The idea is to encourage experience teachers and school clusters, with support from professional bodies or TEIs, to provide TPD services for the school community. Their contribution should be converted into a form of 'currency' or revenue that can be injected into their schools' professional development funds or individual teachers' professional development funds. This new 'currency' for CPD helps provide incentives for collaboration and translate teachers' expertise into capitals which can be re-invested in their own professional development.

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Appendix 1

1. Questions for the Focus-Group Discussion Session

Teachers' experience

1. What is your experience in the use of ICT in learning and teaching (or integration of IT into the curriculum)?
2. What is your experience in the ICT professional development programmes?

ICT competency and professional development

1. What is your view towards the current practice in professional development in ICT?
    -   Does it help you to integrate ICT into the curriculum?
    -   In term of integrating ICT in learning and teaching, do you think there is a need to provide continuing professional development for teachers?
2. What do you think the "model of professional development needs" should be like?

Information literacy

1. Do you think there is a need to introduce "information literacy" into our school curriculum?
2. What is the relationship between information literacy and the subject that you teach?
3. What is the relationship between information literacy and ICT?
4. Do you think there is a need to have professional development in the integration of information literacy, ICT and the subject that you teach?

Expectation and Challenges

1. What must be included in the professional development in ICT?
2. What you wish to be included in the professional development in ICT?

2. Questions for CDC Members

ICT & Curriculum

1. How do you perceive the role ICT in the entire school curriculum?
2. In your view, does the 'IT learning Targets' help to develop in our students necessary IT competence to cope with the challenges of the 21st Century?

Information literacy

1. What is your understanding of the term "information literacy"?
2. What is the relationship between information literacy and school subjects?
3. What is the relationship between information literacy and ICT?
4. Do you think there is a need to have professional development in the integration of information literacy with (in-service and pre-service) teacher training programmes?

Models for ICT professional development

1. What is your view towards the current practice in professional development in ICT? Is that useful in providing a sustainable development for teachers?
2. What do you think the "model of professional development" should be like?

Expectation and Challenges

1. What, if any, must be included in the professional development in ICT/IL for pre-service teachers and in-service teachers?
2. What you wish to be included in the professional development in ICT/IL for pre-service teachers and in-service teachers?

3. Questions for TEIs

Teaching experience

1. What is your experience in the integration of ICT into any pre-service teacher training programmes or ICT professional development programmes for in-service teachers?
2. In the first Five-year Strategy, a target was set to ensure all graduates of pre-service teacher programmes reach at least the "competent" level of competency in IT. How is your institute to achieve this target or have you any other opinions in this aspect?

Information literacy

1. What is your understanding of the term "information literacy"?
2. What is the relationship between information literacy and school subjects?
3. What is the relationship between information literacy and ICT?
4. Do you think there is a need to have professional development in the integration of information literacy with teacher training programmes, in-service and pre-service?

ICT competency and professional development

1. What is your view towards the current practice in professional development in ICT? Is that useful in providing a sustainable development for teachers?
2. What do you think the "model of professional development needs" should be like?

Expectation and Challenges

1. What, if any, must be included in the professional development in ICT/IL for pre-service teachers and in-service teachers?
2. What you wish to be included in the professional development in ICT/IL for pre-service teachers and in-service teachers?

4. Questions for EMB officials

Experience in teacher professional development

1. How do you conceptualize the framework for the provision of TPD for in-service teachers during the post-2003 period? What are the underlying rationales for designing RTC courses?
2. How do you assess teachers' training needs?
3. Can you describe the mechanism for quality assurance? How effective is such a mechanism in maintaining the quality of the training courses?

Information literacy

1. What is your understanding of the term "information literacy"?
2. What is the relationship between information literacy and school subjects?
3. What is the relationship between information literacy and ICT?
4. Do you think there is a need to have professional development in the integration of information literacy with teacher training programmes, in-service and pre-service?

Models for ICT professional development

1. What is your view towards the current practice in professional development in ICT? Is that useful in providing a sustainable development for teachers?
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Expectation and Challenges

1. What, if any, must be included in the professional development in ICT/IL for pre-service teachers and in-service teachers?
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