Component 8

Monitoring and Evaluation
Experience in the six countries except Singapore has shown that monitoring and evaluation are the weakest components in most ICT in education programmes. While a number of stocktaking research studies have been conducted on ICT infrastructure penetration and access in schools, there have been minimal monitoring and evaluation of ICT integration and its impact on teaching and learning. Evaluation is an important phase in the formulation and implementation of an ICT in education programme. Evaluation, both formative and summative, means that policies, practices, and activities are documented, interpreted and analyzed. Both qualitative and quantitative methods are used, including observations, interviews, focus group discussions, reflective journals, questionnaire surveys and assessments. The data collected and analyzed will then provide information on practices and policies to effectively integrate ICT in schools. Unfortunately, the findings of the few research and evaluations that have been conducted have not been widely shared with policy makers and practitioners. This component focuses on three issues of monitoring and evaluation: (i) documentation of the benefits of using ICT in education, (ii) evaluation methodologies, and (iii) programme evaluation.
Lessons learned

Based on the experiences of the countries except Indonesia, the following are the lessons learned with respect to three issues:

1. Documentation of the Benefits of ICT Use in Education
   - Proper use of ICT tools offers students and teachers learning and teaching opportunities and improves teaching and learning processes.
   - Investment in research and development projects and centres has contributed towards examining existing pedagogical practices, revising and refining practices, and exploring new pedagogical approaches to ICT in education.
   - Research has helped policymakers to formulate ICT targets and goals.
   - Evaluation can demonstrate the reasons for the under-utilization of ICT resources and identify major obstacles to their full utilization in schools.

2. Evaluation Methodologies
   - Action research is one of the best methodologies for documenting the process of effective ICT integration.
   - Assessing the learning impact from ICT use is better measured through other means besides the paper-pencil test method.
   - To gather the most meaningful data on the integrated use of ICT in schools, both quantitative and qualitative methodologies should be used, employing various data-gathering instruments, such as case studies, questionnaires, face-to-face interviews and focus groups.

3. Programme Evaluation
   - Countries recognize that evaluation of ICT in education programme should be a continuous process, covering planning, implementation, reflection, refinement, effectiveness and user acceptance.
   - Due to limited experience in ICT use in the region, better quality directions for the programme can be obtained by benchmarking the quality of ICT projects against international studies, standards and best practices.
Proper use of ICT tools offers students and teachers learning and teaching opportunities and improves teaching and learning processes

Studies demonstrate that ICT tools have helped to improve greater autonomy in learning, stimulate students’ sensory and cognitive curiosity, develop life skills, boost self-confidence and facilitate the learning of abstract ideas and theories. These can be achieved for as long as the ICT-based teaching and learning materials are interactive, engaging, multimedia, visually robust, and are integrated in classroom lessons. It is also important that sufficient time is given to ICT use in education. Thus, the teaching and learning benefits provided by ICT include learners’ autonomy, visualization of abstract concepts and relationships, experimentations and conduct of inquiries with simulation packages and joint-construction of meanings between students and teachers. The learning benefits for teachers include collaboration and sharing of resources, expertise and experiences among teachers; anywhere-anytime professional development with teacher training colleges and universities; and learning beyond the boundaries of the teachers’ subject specializations.

a. Singapore: A research conducted by IDA in 2002 (http://schools.s-one.net.sg/findings1.html) cited the benefits resulting from implementation of FastTrack@School on the teachers’ ICT integration capacity and on the students’ learning process. The respondent teachers, heads of departments and principals described the ways by which ICT improved the teaching-learning process and engaged the students. These included the following: (i) interactive multimedia courseware facilitated teaching and learning of abstract ideas and theories; (ii) ICT encouraged self-directed and self-paced learning on the part of the students. There was no time constraint and students had greater autonomy in learning; (iii) ICT integration served as a catalyst to boost the students’ self-confidence as seen, for example, in the benefits derived by students from use of ICT in the presentations - from preparation to the final delivery of the presentations; (iv) ICT facilitated discovery learning as it encouraged students to ask and address more in-depth questions; (v) ICT stimulated the students’ sensory and cognitive curiosity. Most of the students were visual learners and the use of vibrant colours, interactive graphics and icons provided stimulation; (vi) the development of interactive courseware could involve students. When students are engaged in the design and development of multimedia, they acquire a set of life skills.

The respondents also cited how the ICT initiative by IDA and MOE has enhanced the ICT integration capacity of teachers, noting the following: (i) ICT use in training and teaching raises the teachers’ ICT awareness and competency level; (ii) while ICT could never replace real-life teachers, ICT resources complement existing academic resource
materials to enhance learning; (iii) ICT, including both asynchronous and synchronous communication tools, facilitates the exchange of knowledge and resources among the teachers and ensures knowledge-based connectivity among them; (iv) as peer teaching and sharing are practiced in many schools, this fosters knowledge exchange on ICT; and (v) ICT provides opportunities to explore beyond the teachers’ academic areas and to work with ICT vendors in developing instructional design and technical skills.

A survey conducted by the MOE in September 2001 highlights the impact of ICT integration (Soh, 2002) on students, teachers, schools and the community. 90% of the students noted that ICT has made learning more interesting. (82%) feel that ICT use has increased their knowledge, while some 77% believe that ICT has improved their learning and encouraged them to learn beyond their curriculum. 64% feel that ICT has stimulated interaction with their classmates. Teachers have attended 30 to 50 hours of ICT training each. 84% of the teachers express interest in further ICT training, while 77% want to find more ways to integrate ICT in education. 68% feel that ICT has encouraged greater class participation, while 65% find the preparation of ICT-based lessons worthwhile. In most of the schools, a supportive culture for ICT use has been cultivated and ICT applications are now found in various school procedures in administration, counselling and communications. Technology has been a prevalent feature in the schools. For the community as a whole, there is greater student participation in projects with foreign students. Parents, industry experts and academics have been approached to make meaningful contributions. Partnerships with industry have become common and the bonds between schools and the community have been strengthened.

Investment in research and development projects and centres has contributed towards examining existing pedagogical practices, revising and refining practices, and exploring new pedagogical approaches to ICT in education

**a. Thailand:** To showcase ICT research and development, researchers selected a poetry composition project at a large secondary school with a student population of 3,328 and 87 computers, most of which were networked and had Internet access. The students selected assignments of their preference from predefined websites and either paired or formed groups with classmates of their choice. One computer was shared by at least two students. The students helped one another to do the exercises and to answer the questions. In the process, they had to talk, discuss and agree on their views. Teacher-student communication took place on the Web Board developed by the teacher. It was here that the students chose a picture to compose a poem. The group members were the first to comment and score the work. The students used ICT to study verses at www.thai.net/bunga/poem.html, they then individually composed verses for submission to the teacher by e-mail. According to the teachers interviewed, ICT use not only contributed to the students’ better understanding of the content but also enhanced their motivation. Seeing their works on the Internet (www.thai.net/greenpink/ep04.html) also gave them a sense of pride.

**b. Singapore:** ETD and NIE have begun to conduct research on the use of ICT in education. Schools are encouraged to “generate research and development that will enhance the next generation of technology applications for teaching and learning” (Soh, 2002, p.32), and “teachers can look forward to R&D grants to help them experiment on novel teaching strategies and to develop new teaching and learning resources” (Shanmugaratnam, 2002).
Research has helped policy makers to formulate ICT targets and goals

a. **Thailand:** IPST has been involved in several international research studies on ICT in education, the most recent ones being the Second Information Technology in Education Module 1 (1998) and Module 2 (2002), and the Australian-SEAMEO Project, Pre-service Teacher Training and Teacher Professional Development in the Use of ICT in the Teaching of Mathematics and Science in Participating SEAMEO Countries (2001). Findings from these studies are beneficial to current projects and initiatives at national and institutional levels. For example, SITES M1 and M2 provided policymakers and educational practitioners with information about ICT in the education system and the extent to which ICT contributes to educational reform. The MOE has established a computer/school ratio of 1:20 for secondary schools and 1:40 for primary schools, based on SITES M1 indicators. Documentation on these studies has been published and shared among the participating countries and concerned readers.

Evaluation can demonstrate the reasons for the under-utilization of ICT resources and identify major obstacles to their full utilization in schools

a. **Philippines:** A nationwide survey of public and private primary and secondary schools, in which 36,368 out of 46,440 schools participated, was conducted by SEAMEO-INNOTECH. The survey revealed that only 18% of the schools have computer literate teachers, the largest percentage of such schools being in Metro Manila (SEAMEO-INNOTECH, 2002). Only 7% of primary and secondary schools offer ICT-related instruction.

A 1998 study conducted by DOST-SEI to establish baseline data on ICT capabilities in public and private secondary schools revealed that 84% of secondary schools use computers for instruction. The response rate for this survey was 66% or 4,310 out of 6,494 schools (DOST, 2001). Findings of the DOST-SEI study have been validated by a 2001-2002 survey conducted by the Foundation for IT Education and Development, a non-government organization.

A simple random sampling of 100 schools (from the 661 public secondary schools that received computer assistance packages from DepEd between 1996-1998) was carried out to determine levels of ICT utilization and to identify factors that affected utilization (Tinio, 2002). Student-computer ratios were in general quite poor, ranging from 12:1 to 1,098:1 with a mean ratio of 267:1. For schools planning to expand their ICT facilities, space was a limiting factor. In an education system where overcrowding is the norm, classrooms that can be converted into computer laboratories are hard to come by. In secondary schools where computers were available, only 15.2% of teachers claimed to have used them. Of these, only 56.5% used the computers for instructional purposes. In contrast, 92.1% of students in schools with computers reported that they have used the technology for learning activities (DOST, 2001).

Most of the learning activities are “learning the tool” and not “learning with the tool”. Of the total number of computer hours used, 80.4% have been for teaching basic ICT skills and productivity tools, such as word processing,
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spreadsheets and presentation software, and the rest for computer-assisted instruction (CAI). While student access to the technology appears widespread, contact time is fairly limited. Significantly, what little ICT is present in the schools is generally underutilized, especially given that a large majority of the computers have fast processors, fairly new operating systems, and multimedia capability (Tinio, 2002).

Under-utilization is attributed to several factors: (i) lack of guidelines from DepEd on the integration of ICT in different learning areas; (ii) lack of educational software; (iii) lack of hardware peripherals, such as digital imaging devices, graphical tablets, etc.; (iv) low level of teacher competencies in basic computing and Internet use and ICT application in different learning areas and across the curriculum; and (v) lack of funds to pay for full operations (i.e., eight hours a day, five days a week), including the cost of electricity, supplies, telephone time, Internet access, repair and maintenance (Tinio, 2002).

Issue 2

Evaluation Methodologies

One of the best methodologies for gathering data on the integrated use of ICT in education is action research as it enables practitioners to explore and integrate ICT in the school curriculum, reflect on the process and outcome, and amend and refine practices for future use.

a. Singapore: edu.QUEST, an initiative of the MOE, showcased research projects on the use of ICT in education (http://www.moe.gov.sg/edumall/edu_quest/eduquester/default.htm). edu.QUEST projects focus on quality research on the impact of leading edge technologies on educational practices and achievements. Action research is ideal as it is responsive to unanticipated discoveries in the course of experimentation with emerging technologies.

In one such project at Woodlands Primary School, “Turning the Science Garden into a Huge Classroom” (http://www.moe.gov.sg/edumall/edu_quest/eduquester/sciencegarden.html), the teacher turned the school science garden into a huge outdoor classroom with students studying plants in their natural environment and surfing the Web on the spot for further research on the plants. The teacher’s evaluation noted that (i) students can easily relate what they observe in the science garden to what they read on the Internet, (ii) students ask relevant questions and compare observations/findings with their peers, (iii) the learning environment is more interactive and responsive and, as the teacher is able to work with individual students or groups, immediate feedback and adaptive instructions are possible, and (iv) the Network Assistant package permits better management of tasks and the students. For example, it is possible to monitor and freeze the students’ screens.
Assessing the learning impact from ICT use is better measured through other means besides the paper-pencil test method.

There is a need for teachers to be trained on how to construct authentic assessment instruments and interpret the results, focusing on the development of student learning. Training should be a complete process of teaching and learning as well as curriculum development. Assessment methods are new to most teachers and they would have to be trained to select methods suited to specific learning activities.

a. Thailand: The new curriculum standards encourage the use of authentic assessment across the curriculum. The traditional paper-pencil test method is not responsive to an instructional process that focuses on students’ learning, in which students are required to practice a higher level of thinking skills and to engage in hands-on activities to construct knowledge. Evaluation should be obtained from various sources of information and should make use of several methods (e.g. group or individual observation, report or product; interview; student’s record; consulting between students and teachers; practical assessment; performance assessment; and portfolio assessment).

An authentic assessment better reflects what students have learned or performed than the paper-pencil test method, and provides realistic feedback to both teacher and learner. The result of assessment can be crosschecked using several sources of information. A good paper-pencil test method is only able to assess rote learning and gives no information on what a student has learned.

To gather the most meaningful data on the integrated use of ICT in schools, both quantitative and qualitative methodologies should be used, employing various data-gathering instruments, such as case studies, questionnaires, face-to-face interviews and focus groups.

To provide multiple perspectives to an evaluation, the findings should be interpreted and analyzed based on well-established literature on education research, learning theories, management theories and ICT research. The evaluation may be carried out in natural settings in schools of different types and levels, to provide a holistic picture of ICT integration in the schools. Qualitative and quantitative methods are employed to complement each other, enhance the validity and reliability of the evaluation and ensure that the depth and breadth of the study are not compromised.

a. Singapore: The NIE carried out a three-year research project under the Education Research Fund in 2000 entitled, “Effective Integration of ICT in Singapore Schools: Pedagogical and Policy Implications”. Phase 1 was a questionnaire survey to explore the critical aspects of ICT integration, while Phase 2 was a collective case study of 10 schools.

Phase 1 had three main goals: (i) provide a descriptive and interpretive account of critical aspects of ICT integration in the schools; (ii) formulate recommendations to facilitate effective ICT integration, (iii) identify schools for the collective case study in Phase 2. Ten schools (five primary, three secondary and two JC/CIs) were chosen based on their high level of ICT integration.
The questionnaire consisted of five categories: school ICT culture, student use, teacher use, management of ICT resources and staff development. A five-point scale was used for the responses for all items in the five categories.

Case study method was appropriate for Phase 2, given the need to emphasize the context of use. To gather the accounts of various groups and individuals concerning the learning environment, both qualitative and quantitative methods were used, including observations of ICT and non-ICT based lessons, face-to-face interviews with principals and ICT coordinators, focus group interviews with students and teachers, questionnaires for teachers and students, and samples of students’ work.

The project will be completed at the end of 2003. Readers may access the project website at http://eduweb.nie.edu.sg/projects/itintegration for updates.

In the planning and implementation of programme and initiatives, the evaluation phase is very important. This includes both formative and summative evaluations, involving a continuous cycle of planning, implementation, reflection and refinement.

a. **Malaysia**: The ETD in cooperation with the MDC has commissioned two evaluation studies on the Smart School Integrated Solution. Researchers from five local universities conducted one study to evaluate user acceptance and effectiveness of the Smart School Integrated Solution. The final draft of the report, written in Bahasa Melayu, will be available before the end of 2003.

b. **South Korea**: In spite of great success in adapting education to the information age and the heavy investments made in ICT use in education, the effectiveness of ICT integration in education at the national level has not yet been evaluated and the level of integration compared with other countries cannot be ascertained. In the second stage of the ICT Use in Education Plan, the Ministry of Education and Human Resources Development is developing indicators to measure the effectiveness of ICT use in education. The development of such indicators has been divided into four stages: elementary and secondary school education in 2001, higher education in 2002, special education in 2003 and lifelong education and vocational education in 2004. To develop these standardized indicators, the Government is also promoting cooperation among ICT research institutes and strengthening collaboration with international organizations, such as the INES project of the OECD, the Knowledge and Human Resources Development Bureaus of APEC and UNESCO.

c. **Thailand**: Whereas in the past, evaluation was not a part of the ICT programme, the new strategy and master plan now require a phase-by-phase evaluation to obtain feedback and information for monitoring ongoing activities. The long-term evaluation programme is now under consideration at the policy level, not only for local or national
a. **Singapore:** One of the first international studies on ICT integration was the first module of SITES by the International Association for the Evaluation of Educational Achievement (IEA) in November 1998 (http://www1.moe.edu.sg/press/1999/pr991122.htm). The main objective of the study was to assess the status of ICT in schools for instructional activities by teachers and students in 27 countries. Singapore, a leader in the provision of computers and associated peripherals to schools, has a well-planned and implemented staff development programme. Other avenues opened to teachers to learn ICT knowledge and skills and knowledge include ICT courses, training given by heads of departments and peers and sharing sessions. The findings also indicated that in formulating policies, school principals prefer to address ‘emerging’ ICT-related objectives over ‘traditional’ objectives.

b. **Malaysia:** The first study, conducted by Frost and Sullivan, benchmarked the Smart School Integrated Solution against international practices. The report is written in English and is available on request from ETD. It is also available on BESTARInet, the Smart School Portal, www.moe.edu.my.
ICT LESSONS LEARNED

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