Integrating ICT into Education

A Collective Case Study of Six Asian Countries

Indonesia • Malaysia • Philippines • Singapore • South Korea • Thailand
## Contents

Integrating ICT into Education  
Preface  
Executive Summary  
Abbreviations  
1 Broader Environmental Context  
2 Policy and Regulatory Environment  
3 Management and Financing  
4 ICT in Schools – Policy, Vision and Strategy  
5 Technology Infrastructure and Connectivity  
6 Curriculum, Pedagogy and Content Development  
7 Professional Development  
8 Monitoring and Evaluation
This package entitled "Integrating ICTs into Education: Lessons Learned" arose from the rapidly growing body of experiences, and innovative strategies and approaches from countries in Asia and the Pacific. Although the region has recently embarked on this new field of largely untested grounds, since many countries have leapfrogged into the opportunities that ICTs can offer, showing exciting results, this wealth of experiences certainly deserves attention. Numerous case studies have already been written on the use of ICTs for education in Asia and the Pacific, but distilling these experiences, and culling out lessons learned, and innovative strategies and practices has not yet been conducted. This becomes all the more needed when one thinks of the potential waste of funds and investment (setting up ICT infrastructure and facilities), if we are to avoid re-making mistakes and losing good opportunities. Moreover, a synthesis becomes all the more important when one thinks of the little time that policy-makers and managers have to plough through all the available information, much of which could be repetitious or with inconsistent content, not to mention outdated data.

This activity is part and parcel of the *Strengthening ICT in Schools and SchoolNet Project in ASEAN Setting* funded by the Japanese Funds-in-Trust and the ASEAN Foundation. The Project is an attempt to demonstrate that the use of ICT in education will make a difference in improving the teaching/learning process through the systematic integration of the use of ICT into existing educational curricula on science, mathematics and language. In order to attain this goal, the following supporting strategies are implemented: a) documenting of successful
experiences and innovative strategies in the use of ICT in schools from the more advanced countries to serve as benchmarks and guidance for programme planning and implementation; b) policy and strategy development, specifically dealing with integration/mainstreaming of ICT into national education curriculum; c) development of integrated ICT-based curriculum, teaching and learning materials and applications for teaching science, mathematics and language; d) establishing connectivity and pilot testing the use of ICT in 24 schools in eight ASEAN countries based on the previous activities; e) training of teachers in computer literacy, the use of the ICT-based teaching/learning materials in science, mathematics and language, telecollaboration and use of SchoolNets; f) establishment and use of national SchoolNet to promote sharing of information and resources; g) the creation of national and ASEAN SchoolNets and telecollaboration among pilot schools in eight ASEAN countries; and finally, h) sharing of best practices.

The first activity of the project was documenting the experiences of selected countries in the South East Asian countries on the use of technology in education in order to learn from their successes, as well as avoid the pitfalls and failures that have occurred in these initiatives. Such tested techniques and strategies could be adopted to promote the use of ICT in schools in a most integrated way, contributing towards improvements in educational quality and learning.

The documentation of experiences was undertaken through country case studies written by ICT specialists who are directly involved in the implementation of the ICT for education programmes in their respective countries in order to:

1. Document, synthesize and extract lessons learned in the use of ICT in schools and the setting up / impact of SchoolNets in selected countries in order to help improve planning, management and implementation of ICT for education programmes;
Provide tools for advocacy as well as guidelines for policy-makers and practitioners to support ICT in education initiatives; and

Serve as benchmarks for implementing the project activities of the JFIT-funded Strengthening ICT in Schools and SchoolNet Project in ASEAN Setting, specifically the integration of ICT into national curricula of ASEAN countries, the development of Startup toolkit and operation of SchoolNets.

These six case studies are from the following countries and experts:

1. Indonesia – Harina Yuhetty, Director, PUSTEKKOM, Jakarta, Indonesia

2. Malaysia – Chan Foong Mae, Principal Assistant Director, Communication and Training Sector, Educational Technology Division, Kuala Lumpur, Malaysia

3. Philippines – Victoria L. Tinio, Director of E-Learning, Foundation for Information Technology Education and Development Inc., Manila, Philippines

4. Singapore – Lim Cher Ping, Assistant Professor, National Institute of Education, Singapore

5. South Korea – Okhwa Lee, Chungbuk National University, Seoul, South Korea

6. Thailand – Pornpun Waitayangkoon, Assistant to the President, The Institute for the Promotion of Teaching Science and Technology, Bangkok, Thailand

The case studies are very robust and provide a mine of information which can be overwhelming to the readers, especially the policy-makers who may not have the time to go over them.
Thus a synthesis was necessary to highlight lessons learned for the benefit of the following audiences:

1. **Policy-makers** with responsibility for education and ICT issues, especially but not limited to those within the ministries of education.

2. **School-level practitioners** especially at the secondary level, (administrators, teachers, technical support staff), and those involved in the pilot ASEAN SchoolNet project.

The synthesis of these case studies was prepared by Dr. Lim Cher Ping, an assistant professor at the National Institute of Education, Nanyang Technological University. He is the chief investigator of two funded research projects: (1) Effective Integration of ICT in Singapore Schools: Pedagogical and Policy Implications (MOE/Singapore), and (2) Supporting E-discussions with New Technologies in Learning Communities (M1/Singapore). He has published widely and internationally in different areas of education technologies, namely online learning and other ICT-based learning environments in schools and corporations. Carmelita Villanueva, Chief of Information Programmes and Services at UNESCO Bangkok and Tinsiri Siribodhi, ICT Specialist, have also extensively contributed to editing the manuscript.
Executive Summary

Rapid global technological and economic developments have placed greater demands on education systems. The need to inculcate among students the importance of lifelong learning, that is, to constantly seek new information, to think critically and to take initiative has become ever more pressing in our fast-changing world. Countries in Asia and the Pacific have responded to these challenges in different forms and at varying levels so as to enable their people to adapt to change, inspire creativity and innovation, and enhance their ability to apply knowledge and solve emerging problems with confidence. Policies and strategies have been developed to integrate ICTs into education.

While ICT use in education in Asia and the Pacific is relatively recent, it has nevertheless made an impact on education systems. A wealth of experiences, good practices and lessons have been generated for the benefit of countries where ICT use in education has just begun as well as those countries where ICT application and integration in education are well established. This collective case study aims to:

i. describe lessons learned in integrating ICT in education programmes, based on the experiences of six Asian countries namely, Indonesia, Malaysia, Philippines, Singapore, South Korea and Thailand; and

ii. synthesize and analyze ICT integration experiences in connection with specific lessons learned and highlight best practices and the need for further improvements.

In these six countries, ICT use in education is at different stages of development. In its review of 90 ICT projects in Asia, the UNESCO (2003) comprehensive report groups the countries into three categories:

1. Advanced countries with integrated ICT in the education system. These include Australia, South Korea and Singapore. Some typical characteristics of these countries are as follows: almost all classrooms are equipped with computers and other ICT tools; the student/computer ratio is high; Internet access is available in all schools; curriculum revision ensures nationwide ICT integration; delivery of education is increasingly online.

2. Countries where national ICT policies and master plans have been formulated and various ICT integration strategies are being applied and tested (although ICT is not fully integrated in the education system). These include China, Thailand, Japan, Malaysia, the Philippines and India. While there is great variation in their characteristics, there are nevertheless some common features as follows: national ICT policies in education have been developed, and the goals and objectives for introducing ICT in various aspects of education have been established.

3. Some countries where efforts towards ICT integration efforts and formulation of national policies have just begun. There are also countries that have no relevant policies but are running pilot ICT projects. In both instances, however, there is insufficient budget to implement policies and work plans and ICT infrastructure and penetration are poor. This
Because of the different levels of ICT integration in the six countries, alongside many similarities in their experiences of ICT integration, there is a variety of approaches that should be explored and examined. An analysis of experiences and best practices and associated problems has generated lessons learned in the following eight components of ICT integration in education: (i) broader environmental context, (ii) policy and regulatory environment, (iii) management and financing, (iv) ICT in schools – policy, vision and strategy, (v) technology infrastructure and connectivity, (vi) curriculum, pedagogy and content development, (vii) professional development, and (viii) monitoring and evaluation.

These components provide the key foundation and framework in setting up ICT for education programmes. A synthesis of lessons learned from selected countries in the region provides the basis for the development of tools and blueprints to guide policy formulation and programme improvements. It also serves as an advocacy instrument to gain the support of policy-makers and other stakeholders for the appropriate use of resources to support the integration of ICT in education.

The following summary provides an overview of lessons learned.

I. Broader Environmental Context

1. Education System Responsiveness
   - A well-planned and responsive education system provides an appropriate enabling environment for the successful implementation of ICT in education policy and programme
   - To make ICT an integral part of the education master plan and ensure programme support, the ICT in education policy should share the same vision as other educational policies or initiatives

2. ICT in Education Policy and ICT Infrastructure Support
   - An ICT in education policy that is driven by a vision which can be translated into action targeted at realistic and manageable goals contributes to successful programme implementation
   - A holistic approach to ICT in education policy goes beyond a technological dimension
   - Adequate physical and technological infrastructures are necessary conditions for effective ICT integration

3. Economic and Social/Cultural Context
   - A well-developed ICT infrastructure in the economic sector facilitates successful implementation of ICT in education policy
ICT in education policy is one of several key economic strategies to ensure sustained economic development of any country.

II. Policy and Regulatory Environment

1. Policy Development

To ensure that ICT in education policy is integrated in the national ICT policy, Ministries of Education (MOE) should work closely with other government organizations, especially those in charge of implementing national policies on ICT and telecommunications.

Lessons learned from pilot projects and studies in education that are carried out at different levels of the school system provide the basis for further policy expansion.

Harmonized implementation of ICT in education programmes can be achieved by defining clearly the roles and responsibilities of all departments (within the MOE and other relevant ministerial departments) in the implementation of ICT master plans, showing clearly the different components of project activities, including budget allocations, manpower requirements and timetables.

2. Transforming Policy into Action

Phased implementation of ICT in education policy ensures that the implementation process is manageable and the development of best practices and lessons learned is gradual. It also provides opportunities for evaluations so that the policy can be revised and fine-tuned.

Central support from the MOE to pursue a clear and measurable vision helps in developing and implementing a comprehensive programme for the capacity building of schools in using ICT in education.

3. Legal and Regulatory Framework

Initial filtering of the Internet from undesirable websites is necessary in order to prevent their harmful influence on younger students who may not be able to discern the veracity and reliability of information.

More than any software or hardware device, better protection is ensured by making education on safety issues pertaining to the Internet an integral part of parenting as well as of teaching and learning activities at home and in the school.

4. Macro-Economic Impact

To narrow the digital divide, ICT in education policy should complement other government initiatives, such as public education on ICT, donation of computers and provision of free Internet access.
5. Inter-Ministerial Collaboration

- Sharing expertise, experiences and infrastructures among ministries and government agencies helps to coordinate and harmonise implementation of ICT in education programmes
- Creating a national policymaking, regulatory and implementing agency for ICT development systematizes inter-ministerial cooperation on ICT in general, including education
- Beyond ministries and government agencies, inter-ministerial collaborations could involve private sector participation

6. Advocacy and Support from Policymakers and Other Stakeholders

- By linking the objectives of ICT in education policy with national education objectives, support from policymakers and other MOE stakeholders, including human capacity building, could be more forthcoming
- By making policymakers and stakeholders regularly aware of and updated on the benefits of ICT to education, based on research results and documentation of experiences, advocacy for the acceptance of ICT use in education is further strengthened
- By making all decisions taken or amended by the MOE’s highest steering committee known to all members of the committee and heads of departments, their sense of ownership and involvement is enhanced

III. Management and Financing

1. Leadership and Management

- Having a champion at all levels in the education system promotes ICT acceptance
- Including ‘ICT in Education’ as an important component in the development programme for administrators supports the introduction of innovative use of ICT in schools

2. Harmonizing ICT in Education Programmes with Other ICT and/or Education Initiatives/Projects

- To avoid duplication of work and dilution of funds, there should be coordination of ICT in education projects and sharing of information on ICT

3. Dichotomy between Educators and Technologists

- To ensure that ICT in education projects are not just technology-driven, they should be managed by a team composed of educators and technologists
4. Resources at Ministerial and School Levels

- To ensure the site readiness of all schools, there must be adequate, initial financial investment by the government at the national level, especially on basic ICT infrastructure and resources.

- Every school is different and each one should be given some autonomy to select ICT resources that are most suitable to the needs of teachers and students.

- Investments in ICT infrastructure and resources in schools create an environment that is conducive to learning.

- The MOE should be encouraged to establish a standard budget based on school size and existing resources rather than to apply one formula for all schools.

5. Resources from Donors and the Private Sector

- Financial and resource support for the implementation of ICT in education policy is mobilized if school-industry partnership is an integral part of such policy. In addition, schools are able to explore and experience emerging technologies and pedagogies.

6. Strategies to Ensure Sustainability

- Preparing and disseminating guidelines on how to source funds empower schools to look for their own funds and to identify expertise to promote sustainability.

IV. ICT in Schools – Policy, Vision and Strategy

1. ICT in Schools: Vision and Plan

- A clear vision of ICT integration in schools that is shared by all members of the school community promotes effective use of ICT in the classroom.

- An ICT master plan that is formulated according to a school’s vision and its socio-cultural setting assures effective integration of ICT.

2. Supporting Policies to Facilitate Uptake of ICT

- To promote ICT uptake in schools, school leaders should initially adopt strategies that make ICT part of the daily routine or tasks of the teachers.

- To promote use of ICT in schools, the MOE should set guidelines for schools on the integration of ICT in the curriculum, without necessarily imposing these as rules or regulations to be strictly adhered to.

- ICT use in schools is more likely to be facilitated if school leaders employ strategies that provide teachers with a platform and support for the integration of ICT in the school curriculum.

- Appointing an ICT coordinator or head of ICT department in each school helps to ensure administrative and pedagogical support for the teachers.
3. Management of ICT Resources

- Carrying out a SWOT analysis and applying its findings help to optimise use of ICT resources

4. Translation of Laws into Acceptable School-Level Regulations

- Translating ICT in education policy and laws into a set of school-level regulations and procedures provides a clearer blueprint for schools on the use of ICT

5. Parents and Community Involvement

- ICT bridges and strengthens the home-school connection and, if properly harnessed, promotes parents’ activities and involvement in the school

- When parents are encouraged to participate in and contribute to change management activities within a school’s ICT master plan, change occurs more quickly

- As ICT opens opportunities to collaborate with different organizations and people in local and international communities, schools should establish linkages with different communities to help in developing the overall character of students

V. Technology Infrastructure and Connectivity

1. Mobilizing Support from Telecommunications and ICT Organisations and Industries

- Tapping local telephone companies and ICT industries for support promotes affordable Internet connectivity and computer hardware and software

2. Choice and Mode of Deployment of Technologies

- When deploying technologies to schools throughout the country, establishing a balance between equity and effectiveness is necessary

- Deploying ICT in different types of pilot schools or demonstration schools will generate lessons on how to increase ICT use at different school levels and cull best practices

3. Connectivity Options/Alternatives

- Use of satellite and Internet schemes has enabled some countries to reach marginalised areas or economically disadvantaged groups

- Working closely with Internet Service Providers (ISPs) helps in determining appropriate bandwidth connection in schools and homes
4. Infrastructure to Support and Deliver Teaching and Learning

- There is no perfect combination of online and offline resources to promote effective teaching and learning
- Digital libraries for schools may be introduced as infrastructure to support and deliver teaching and learning

5. Emerging Technologies: Dealing with Rapid Development of Technologies

- ICT pilot projects should not take more than three years to complete since the obsolescence rate of present-day technologies is increasing
- Mobile computing offers schools many opportunities that include overcoming constraints of space and giving flexibility in anytime-anywhere utilization of ICT in schools
- Leasing equipment from private companies can be one solution to the problem of rapidly increasing obsolescence rate of present-day technologies

6. Donation of Computers

- Vocational colleges can be tapped to provide maintenance service for computers donated to schools
- Donated computers that have exceeded their lifespan may be redeployed for other uses or may be offered to needy students in other schools or some government and charity organizations.

7. Open Source Software

- Although open source software (Linux-SIS, locally-developed word processor and digital toolkit for developing web content) is encouraged in the schools, there are limitations that must be taken into account before schools decide to use open source software

8. Guidelines on Information Security

- Preparing and disseminating guidelines on ICT security help in dealing with information security problems in schools

9. Integrating School Management Software with Learning Management System (LMS)

- Maintaining the inter-operability of a common school management system while ensuring that decoupling is built into the system is a need expressed by most countries
- There should be adequate in-house training to help school staff and students in using LMS and in coping with the transition from manual to automated processes
VI. Curriculum, Pedagogy and Content Development

1. Integrating Technology in the Curriculum and Assessment
   - When teachers perceive ICT as a tool to meet curricular goals, they are more likely to integrate ICT in their lessons
   - Equipping students with ICT skills facilitates the effective integration of ICT in schools
   - Teachers play a pivotal role in the integration of ICT in the school curriculum and assessment
   - When ICT is introduced into the assessment process, there is a need to reconsider the assessment approaches

2. Shift in Pedagogy as a Result of Integrating ICT in the Curriculum
   - Shifting pedagogical approaches to the use of ICT in education is time-consuming
   - Shifting pedagogies, redesigning the curriculum and assessment, and providing more autonomy to the schools help to optimize the use of ICT
   - Shifting pedagogical approaches is facilitated through appropriate professional development of teachers

3. Contents and Services that Support Continuous Improvement of Curriculum Practices
   - Attracting well-established foreign education software developers to work with local companies helps to develop high quality ICT-based resources
   - Establishing a clearing house or digital libraries of ready-to-use and customizable ICT-based resources promotes better use of ICT in teaching and facilitates quick and easy access to resources for making lesson plans and for teaching

4. Development and Selection of Culturally Sensitive Content
   - Having a mechanism in place for evaluating content developed for schools ensures political and cultural validity, reliability and correctness

5. Ethical and Political Implications of English as Lingua Franca
   - While local content in the local language promotes better use of ICT-based resources and materials, the use of English in schools optimizes the potential of ICT (especially the Internet) for teaching and learning

6. Intellectual Property Rights Related to Educational Software
   - A cost-benefit analysis conducted before deciding on whether to acquire the intellectual property rights to educational materials, or to acquire a perpetual license
to use the materials, prevents waste of resources

VII. Professional Development

1. Policy and Management of Teacher Training on ICT

- To ensure continuous training of teachers from pre-service teacher education to induction to in-service professional development, training agencies should be mobilized and labour divided among them, with the MOE providing central coordination

- Professional development is more likely to succeed if continuous training of teachers is a built-in process and is offered as a benefit to them

- A centralized training administration system for all teaching and non-teaching staff is crucial to document and monitor professional development

2. Teacher Training Modalities

- Peer and school-based training of teachers by their more experienced peers from other schools or senior instructors from the MOE ensures that teachers are trained in the context of their workplace

- Incorporating online learning into professional development on ICT enriches teachers’ experience and makes them comfortable with online learning

- Needs-based just-in-time learning and peer coaching ensure further development of teachers’ ICT and pedagogical skills

3. Teachers’ Competencies and Standards

- ICT competency standards serve as a benchmark for formulating and evaluating teacher training programmes and use of ICT in teaching

- Customizing national-level ICT competency standards for each school, depending on its socio-cultural context, ensure ICT integration and acceptance

4. How to Change Mindset of Teachers

- A buddy system approach where novice teachers work together with expert teachers in a classroom using ICT contributes towards changing prevailing mindsets

5. Content Focus of Capacity Building for Teachers

- Training teachers on ICT-related skills within the context of classroom objectives and activities ensures development of skills in the integrated use of ICT in teaching

- ICT professional development programme for teachers should be planned, taking into account the vision of ICT in education policy
6. Capacity Building for Education Personnel at All Levels

- Training education personnel at all levels ensures that all aspects of ICT use in schools are implemented in an efficient, coherent and complementary way.

7. Incentive System and Motivational Strategies for Teachers

- Formal certification of in-service professional development that leads to diplomas or degrees could provide an incentive for teachers to upgrade and update their skills in and knowledge of ICT integration.

- Teachers’ interest in using ICT after their training is more likely to grow if they are provided with computers, training materials and software for classroom use.

8. Monitoring and Evaluation

1. Documentation of 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

- 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.
Abbreviations

AICTP • Accelerating the Use of ICT in Primary Schools, Singapore
CAT • Communications Authority of Thailand
DepEd • Department of Education, Philippines
DTI • Department of Trade and Industry, Philippines
DOST • Department of Science and Technology, Philippines
ETD • Educational Technology Division
IDA • Infocom Development Authority of Singapore
IPR • Intellectual Property Right
IPST • Institute for the Promotion of Science and Technology, Thailand
KERIS • Korea Education and Research Information Service, South Korea
NIE • National Institute of Education, Singapore
MDA • Media Development Authority, Singapore
MDC • Multimedia Development Corporation, Malaysia
MICT • Ministry of Information and Communications Technology, Thailand
MNC • Multinational Company
MOE • Ministry of Education
MP1 • First Master Plan for ICT in Education, Singapore
MSC • Multimedia Super Corridor, Malaysia
NCB • National Computer Board, Singapore
NECTEC • National Electronics and Computer Technology Centre, Thailand
RBEC • Revitalized Basic Education Curriculum, Philippines
SEI • Science Education Institute, Philippines
SITES • Second Information Technology in Education Study
SSMS • Smart School Management System, Malaysia
TOT • Telephone Organization of Thailand
WAN • Wide Area Network
ICT LESSONS LEARNED