A. Objectives

1. To support government ICT policy

This is presumed here since most of the teacher training on ICT programmes reviewed are being implemented directly under the government or quasi government auspices; government partnership suggests that one of the objectives of the training programme is to support the ICT for education policy and overall ICT master plan of the government. This is supported and confirmed by the fact that most of the administered questionnaires indicated that the countries concerned do indeed have a policy and master plan on teacher training in ICT.

There could be just a few of these training programmes which may operate on their own and conduct training programmes on an ad-hoc basis but are not necessarily linked to the government’s policy initiatives and master plan. This could occur if an external donor directly approaches NGOs whose teacher training programmes on ICT may not have any links to the government’s efforts.

A good example of an explicit goal in this area is provided by the Malaysian Coca-Cola eLearning for Life initiative, which very clearly states its support of the Malaysian Government in efforts to expand the K-Society and the K-Economy and to revamp the educational system to respond to the knowledge-driven demands of the new economy.

2. To develop/upgrade knowledge and skills in basic computer literacy and integrated use of ICT in teaching - yet specific/concrete competencies to be improved among teachers and other professionals seldom articulated

Most of the training programmes carry general objectives aimed at developing awareness, knowledge and skills in either the use
of computers per se, or the integration of computers into teaching. As to what specific competencies are being developed or strengthened in the various uses of ICT in teaching, these are most often not well articulated.

Most of the countries in the region lack official standards/benchmarks concerning teaching/learning competencies of the teachers and students; standards which can guide in formulating objectives and expected outcomes in ICT training programmes. The inventory has found a few exceptions to this – the more advanced countries like Australia, South Korea and Singapore, for example, have formulated the ICT competencies required of teachers. Donor-funded training programmes, such as those run by Intel or Coca-Cola, among others tend to provide more concrete objectives and expected outcomes. A few examples of these are:

- To develop skills in using ICT to support student-centred, inquiry-driven teaching and learning activities
- To undertake extensive research on differential learning experiences which will provide the appropriate pedagogy for ICT-based learning
- To encourage teachers to work in teams, problem-solve, and participate in peer review of their lesson plans
- To design ICT-based constructivist activities
- To develop skills in telecollaboration and working in teams for project-based lessons
- To engage teachers in hands-on learning and the creation of lesson plans and evaluation tools
- To develop models of learning using electronic performance support systems and knowledge management
- To develop skills in the use of productivity and communication tools

3. Training content thrusts generally support three major objectives as far as competency development is concerned

Teacher and staff training programmes usually aim at achieving any or a combination of three general objectives as far as competencies are concerned. These include developing knowledge and skills on:

a) basic computer literacy per se, not necessarily linked to teaching;
b) on the use of ICT hardware and software but linked to teaching and learning; and

c) the effective use of ICT for improving pedagogy in teaching different subject areas, classroom management and in telecollaboration and online school activities.

Most of the countries in the region have learned from the mistakes of the past where teachers were first trained just on basic computer literacy, after which the knowledge and skills learned were never or rarely applied in the schools.

It was observed that an increasing number of countries are now undertaking training to develop skills in the use of ICT in teaching and other school activities, including classroom management, to ensure that teachers bring their skills to actual classroom teaching. For example, South Korea’s teacher training objectives are all directed towards developing the skills of teachers to use ICT in teaching Korean, English, Social Studies and Science in 2002-2003 and Ethics, Mathematics, Music, Art, Gymnastics, and Technical/Home economics in 2003-2004.

Higher level teaching pedagogy is offered by Singapore’s teacher training programmes, while Intel-funded countries start their training programmes from planning an ICT-based lesson to be integrated into a subject.

The differences in training objectives or thrusts are not only found between countries but also within a country itself. For example, while the cascade type of training usually starts in a holistic and more comprehensive manner during the training of trainers, the second level ends up with diluted objectives and contents aimed at just training teachers in basic computer functions and operations. The original training strategy gets watered down due to the huge numbers of teachers to be trained and lack of time and resources.

4. The importance of developing teachers’ skills in computer configuration and troubleshooting is beginning to be realized by only a few programmes

Only in very few programmes one finds training objectives that go beyond developing teacher competencies in the use of ICT, into ICT management and technical support, including troubleshooting. This is an aspect which a programme on ICT use in schools cannot exist without, considering that frequent unresolved computer
breakdowns are experienced in many countries (very often with donated, second-hand computers) which result in dampening teachers’ enthusiasm.

Philippines’ Coca-Cola Edventure and Malaysia’s eLearning for Life, for example, have objectives that focus on developing skills in managing ICT facilities, strategies in resolving technical problems or troubleshooting, as well as touching on financial and resources issues.

5. **Skills to undertake online collaboration are gaining ground but require strong connectivity**

More and more countries, especially those funded by World Links and Intel, include in their training programmes a strong emphasis on the use of online tools for collaborative activities, telecollaboration, chatting, discussion groups and building and maintaining online learning communities. World Links also provides opportunities for online learning for the professional development of teachers in the use of ICTs, apart from its face-to-face professional development.

The issue of increasing bandwidth is intertwined with online collaboration, a problem expressed by Australia, among others, as a major need to be met.

Many developing countries may experience frustration over the type of skills to be developed if they lack adequate online facilities to support e-learning.

6. **Reaching the community**

A few training programmes also go beyond school-based training by offering training to the community through school hubs, as in programmes from World Links, Malaysia and Intel-India. Here, the aim is to build ICT hubs and ICT community centres in selected schools to provide access to ICT training to other schools, as well as to the communities in the vicinity. The World Links training programme is also aimed at encouraging the development of school-based telecentres.

7. **Providing technical advice and support**

While some of the training programmes are one-shot activities, a few programmes, as in Australia and World Links countries, provide continuing follow-up support through in-country technical advice and consultancies after the trainees return to their countries. Some organizations run school-based initiatives or centre-based
programmes meant to provide instant response to requests for technical assistance. Follow-up services also include providing consultation in feasibility, connectivity, policy and strategy development, e-learning, curriculum development and others.

This objective is very rare but most practical in further enhancing teachers’ mastery of skills, while promoting sustainability in ICT use in schools.

**B. Training Recipients and Scope**

1. **Type of trainees**

Courses are most frequently oriented toward in-service teachers, perhaps because pre-service teachers are gaining access to ICT curricula during their university or college studies. Countries either train all in-service teachers in all subject areas, or only those teachers teaching selected priority subjects. South Korea, India, Mongolia and Viet Nam all concentrate on training in a few subject areas first and then expand training to other subjects as the project progresses.

While teachers are the main target audience, many of the inventoried programmes also address the critical need for administrators to understand the management issues of technology well enough to make sound decisions for ICT policy and programme implementation. Afghanistan, Mongolia, Pakistan, World Links-funded countries and Coca-Cola and Intel projects include principals, headmasters, supervisors and administrators in their training courses.

The number of countries providing ICT training at both pre-service and in-service levels is growing. Four inventoried countries, namely, India, South Korea, Singapore and Indonesia, have reported that both in-service and pre-service teachers have been trained and in massive numbers. Singapore and South Korea have integrated pre-service teacher training on ICT in various undergraduate and graduate studies, while an increasing number of universities/colleges in India are just starting to integrate ICTs into their teacher training colleges. The more advanced countries usually cover both in-service and pre-service K-12 teachers (South Korea, Australia, and the U.S.). Intel-funded countries (China, India, Japan, Pakistan,
Malaysia, Philippines, South Korea, Taiwan and Thailand) also cover both in-service and pre-service teachers.

The public at large and communities are also being reached. A few online training courses are open to the general public. Some projects, such as Malaysia’s eLearning for Life, World Links-sponsored countries and IBM, include community participation in various forms as a means to broaden the scope of their programme and provide ICT access to the community. IBM addresses the learning community and encourages parental participation, while World Links employs a more direct community role through the development of community learning telecentres based in the schools.

2. School level of trainees

Teachers are being trained at primary, secondary and collegiate levels. However, due to funding constraints and the massive infrastructure and facilities required, secondary level training is initiated first in many developing countries. The more advanced countries cover all three school levels simultaneously, as in Australia, South Korea and Singapore, among others. Most of the World Links-funded countries cover the in-service secondary level only. Malaysia’s eLearning for Life and Philippines’ Coca-Cola Edventure cover in-service training for the secondary level.

3. Number of teachers being trained and already trained

The number of teachers being trained varies greatly from country to country. Inventoried programmes have reported having trained huge number of teachers, especially in those countries which have had a long history of training, are more financially endowed, and are more advanced in their ICT development. South Korea, for example, reported of having trained all teachers in selected subjects, or a total of 3,897 in-service teachers per year. Intel India has reported of training 230,540 in-service teachers across 35 cities in India and a total of 29,702 pre-service teachers. Intel Malaysia has trained over 15,000 teachers to date, while the World Links-sponsored training programme in India has trained 130,000 teachers.

Some countries start with small numbers of teachers per school, such as three to four teachers per school in several schools or ten teachers from a few pilot schools. The number of teachers to be covered also depends on the scheme being followed. Malaysia’s eLearning for life and Intel’s Teach to the Future train a specific number
of teacher trainers in each school who, in turn, are instructed to train the other teachers in their respective schools. This cascade type of echo training ensures that more teachers will have the opportunity to be trained on ICT simultaneously nationwide.

A number of the projects start with selected pilot schools spread all over the country, a selection of sample schools representing the urban, semi-urban and remote areas, as in the Philippines, or a concentration within a single region of the country, as in the Western provinces of China.

Most of the projects inventoried are undertaking the training on a selective basis - pilot testing on a few schools first reaching not more than 1,000 trainees per year, while many are training nationwide.

4. Geographical coverage, location, duration

Most of the more advanced countries - in terms of length of ICT use and presence of donors like Intel - cover wide areas in their training. The location of training is generally in the country capitals, if not major cities and often covers selected provinces or regions of the country, as in China, Malaysia, South Korea, the Philippines and so on. If training runs nationwide, the training courses are usually organized or coordinated by the provincial or regional education offices.

It should also be noted that different donor-funded teacher training projects select various parts of the country to avoid overlap, and consequently result in covering many different places nationwide. China, the Philippines, Viet Nam, Malaysia, Coca-Cola, Intel and IBM sponsor various teacher training programmes on ICT in different places in the country. Meanwhile, emerging countries like Afghanistan, Cambodia, Lao PDR, Mongolia, Myanmar, and Viet Nam are going slowly in extending their coverage by just pilot testing the activities in a few provinces or schools.

The duration of training varies from country to country - 5, 10, 14, 21 days (Mongolia); 10-15 weeks (Afghanistan); one week and 20 days (Pakistan); 14 days (Korea and Viet Nam); or as short as 2 days on specific training on the use of Internet for university teachers in Indonesia. South Korea uses 60 hours/30 hours/15 hours to measure the length of teacher training programmes. Malaysia’s Intel-sponsored training programmes require 40 hours of in-class
training for 10 modules (at 4 hours each) and 20 hours of take-home activities. The length of training is critical in planning a teacher training programme on ICT, as if a course is too short, how can teachers be expected to have developed the knowledge and skills sufficient for confident classroom application?

5. **Trainers**

Who are the trainers? One will note that most of the trainers were sourced from outside the organizations. These include trainers from funding agencies (in Afghanistan and Mongolia among others); from universities of technology (in Mongolia); from training centres (in Mongolia, Pakistan, Viet Nam); and experts invited from various organizations (in Mongolia, Viet Nam).

Four countries inventoried reported of running training courses by in-house trainers (Indonesia, Singapore, South Korea and Viet Nam). Countries sponsored by Intel in their Teach to the Future Project rely on the peer approach type of training and thus mobilize local skills across the country in spreading ICT skills among teachers. The same holds true for Coca-Cola’s eLearning for Life Programme in Malaysia.

Key issues that arise in this area are the lack of trainers who are pedagogy-based; the need to form a training team that will comprise subject specialists, pedagogy specialists, and ICT experts to ensure developing pedagogy-based ICT skills; the need to develop a critical mass of trainers who are skilled in the pedagogy-based integrated use of ICT; and the effectiveness of the peer approach in cascade training.

C. **Programme Sponsorship**

The inventory presents programmes that have been developed through a variety of means. International organizations like the World Bank and individual national development agencies have pioneered some of these programmes. Technology industry leaders have also championed the development of programmes, often engaging the governments of the specific nation within which they work. Examples of these donors which pioneered teacher training on ICT include Intel with Microsoft, Coca-Cola, IBM, World Links, World Bank, Bellanet, UNDP, Japanese Funds and JICA, among others.

The more advanced countries like South Korea, Australia, Singapore and Malaysia receive a large portion of funds for teacher training from
Government allocations. In summary, sponsorship has been an important aspect for providing training and pedagogy in emerging nations. The costs of technology and the continued expansion of training programmes to a large body of in-service and pre-service educators are enormous, explaining why it was not possible for the Governments of some countries to do it alone. Outside help at the beginning of the programme on ICT for Education has been necessary.

Some agencies, like Bellanet iTrain have provided enormous assistance by making materials available in a variety of languages. Other organizations, like Intel, World Links, and Japanese Funds have provided assistance by provision of programme sponsorship around the world. Some of these programmes also provide the hardware and software like Microsoft products.

Many programmes have worked directly with governments, bringing curriculum to the professional development communities working in government schools. Together they build the capacities of staff and encourage the spread of ICT teaching to places where otherwise resources may not yet be available.

Issues in sponsorship

1. **Cost in developing modules**

Some argument could be made as to the cost effectiveness of emerging nations developing their own modules, rather than localizing content that already exists. Pilot training projects which were sponsored by external funding institutions have developed such modules in many countries. These could be revised and adapted for either initiating or for further expansion of existing professional development programmes in the region.

2. **Training scheme**

There seems to be a trend to employ the peer training approach, especially with Intel-sponsored programmes, where teachers from schools are trained first and when they go back to their respective schools are instructed to train the rest of the teachers.

On the one hand, such an approach has the advantage of skipping the pilot testing phase while promoting the immediate spread of technology skills development on a nationwide basis, as well as allowing native language peer-to-peer instruction of the content.
Yet the main disadvantage of this approach is the dilution of the quality of the training, especially if the trainer has not mastered enough knowledge and skills to share with other teachers.

A spot check in one school in the Philippines following this approach has shown that although a teacher had been trained as a peer trainer in various aspects of ICT use, including the integration of ICT in teaching, the peer training they conducted in their school only covered basic computer literacy, neglecting integrating technology within the teaching/learning process. Another weakness may be that the teacher trained is not able to transfer the knowledge in the time limits given and in the midst of inadequate support.

3. Access to online facilities and infrastructure

In terms of access, language, programme coverage, infrastructure, and copyright must be considered, amongst other issues.

Infrastructure is a key issue that is sometimes overshadowed. The cost associated with the provision of adequate access to the Internet is prohibitive for the educational systems in many emerging nations. In order for countries to use materials that may be online, they need infrastructure that can support rich media, because even the most simple of demonstration programmes (ActDen) uses a high graphic representation in its more accessible version without Flash.

A few of the teacher training projects covered in the inventory in fact promote online collaborative projects and telecollaboration, use of Internet resources to develop lessons and lesson plans, chatting and engaging in discussion forums, etc. which require a reliable connection, i.e. broadband, which is costly.

The issue of language is another significant factor to consider, as most of the resources are in English and are not easily understood by many in the region.

D. Training Contents

Most of the countries inventoried indicated that they have produced modules and materials for use in training teachers and other education professionals. Some general trends can be seen from a review of these contents.

Within a country where varying kinds of teacher training programmes on ICT sponsored by various donor agencies simultaneously take place, the content focus tends to differ. The content focus can range
from being hardware and software applications-oriented with no
link to teaching/learning; to a combination of basic computer
literacy and the use of hardware and software in teaching/learning;
to a more pedagogy-based and integrated use of ICT in the
schools, not only in teaching but also in management, online
collaboration and communications. The content thrusts are also
dictated by the purposes and mandates of the donor agencies.

The Intel Teach to the Future programme provides a flexible,
modular curriculum delivered by teachers for teachers. The
curriculum is based on MS Office 2000 Professional as a teaching
and learning tool. The training incorporates the use of the Internet,
web page design and multimedia software. Countries have the
prerogative to modify the modules and training offerings based on
specific country needs and context.

It is interesting to note that most of the administered questionnaires
submitted by emerging countries focus on basic computer literacy
- hardware and software applications. Basic computer literacy
refers to developing knowledge and skills on PC structure and
functions; operation systems; MS Office applications like Word,
Excel and PowerPoint; e-mail; and the Internet, as has been the
focus in Mongolia, Pakistan and Afghanistan, among other
countries. Training programmes given by JICA as seen in Mongolia
and Thailand tend to focus on Linux applications and installing
and configuring Linux – too complicated and technical for primary
school teachers.

Training programmes that go beyond the basics and cover the
integrated use of ICT and pedagogy, as well as applications of
teaching/learning principles on instructional design and
development are run by Singapore, Australia, Malaysia and South
Korea. Many training programmes sponsored by Intel, IBM, Coca-
Cola and World Links also place a high premium on online
telecollaboration and networking, as well as classroom
management, even including sessions on troubleshooting.

Synthesis of training contents

This synthesis is offered by various countries and sponsors in their
training programmes on ICT, categorized into common groupings:
Three main trends in content focus

- basic computer literacy, dealing with hardware and software/applications without necessarily being connected to teaching and learning (ActDen; iTrain of Bellanet). In some countries, the content just deals with developing skills on the basic operations and functions of a computer with no software applications included in the training.

- basic computer literacy also as the main focus, but this time in relation with or in support of teaching and learning activities as shown in their practicum and exercises.

- contents that integrate the use of ICT and pedagogy; use of ICT in teaching specific subjects in the classrooms; the Internet as a pedagogical innovation and used for collaborative activities; school and classroom management with troubleshooting techniques thrown in for a few of the programmes.

1. Under basic computer literacy, the following course contents are offered:

   a. Basic computer parts and functions (opening, closing and saving files, optimizing the hard disk, managing files, opening and renaming files, viruses, zipping and unzipping, etc.)

   b. Operating systems (Windows Operating System and others)

   c. Software applications – MS Office (not necessarily linked to teaching/learning)

   - Word processing (MS Word)
   - Spreadsheets (Excel)
   - Presentations (PowerPoint)
   - Website navigation and Internet searching (Internet Explorer, Netscape)
   - E-mailing (MS Outlook, Eudora, Pegasus), Website development/designing (FrontPage, Dreamweaver)
   - Graphics and drawing (Paint Shop Pro, PhotoDraw, Adobe Illustrator, Inspiration)
   - Databases, data entry, and programming (Access, Pascal, Coldfusion)
   - Desktop publishing (Publisher, PageMaker, etc.)
   - Designing print materials (elements of design and layout, using fonts, graphics and colours)
Overview from Selected Countries

2. Under the second trend - use of ICT hardware and software for teaching/learning activities, the same topics under category one are also given, but are more linked to teaching and learning, where samples and practicum exercises demonstrate how such software and applications can be used for various teaching and learning activities. Below are examples of these course contents:

a. Creating student reports in Word, Access, and others
b. Using Excel to create class lists and for assessment record-keeping in the classroom, alarms, split screens, assessment and print worksheets and spreadsheets etc.
c. Creating animations for integration into art studies
d. Using WebQuests - online problem solving tasks to support a thinking-oriented and student-oriented curriculum and to collaboratively develop their own online curriculum resources
e. Using PowerPoint for presentations in the classroom for a variety of curriculum areas
f. Using NetMeeting in the classroom, including the use of chat, whiteboard sharing, files, cameras and microphones
g. File management for teachers for creating folders, moving files, renaming files, etc. for their assignments and documents
h. Using Publisher software to create a class newsletter or teachers’ newsletter and students’ publications
i. Using FrontPage/Dreamweaver for creating a classroom webpage
j. The Internet for teaching/learning

● Scanning text and graphics
● Video – video production and editing (script writing, shooting, video graphics, sound recording, editing)
● Chatting, discussion groups (ICQ)
- Intellectual property and Copyright laws
- Creating an Acceptable Use Policy

- Internet access and safety issues
- Using the Internet for teacher-led instruction, student-directed learning and project-based learning
- Creating an Internet-based lesson plan
- Meeting academic standards with the Internet
- Publishing on the Web

k. Creating a website or web page for teaching/learning

- Website as a pedagogical communications tool
- Website as a container of curricular materials
- Web publishing in the classroom
  - Tools and fundamentals for web page creation and publishing
  - Building a Web-based project or activity that integrates the Web into the classroom

l. Using e-mail for telecollaboration

m. Developing productivity tools like templates, tests, mark sheets

n. Creating multimedia presentations for teaching a lesson

- Instructional media design and multimedia design
- Various basics, tools, software, multimedia applications to create a multimedia project for the classroom (HyperStudio, KidPix, PowerPoint, etc.)
- Searching the Internet for good multimedia lessons, activities and resources as well as pedagogical issues
- Creating a standards-based lesson, unit or project that integrates multimedia

- Using and producing video for classroom teaching
- Instructional photography
- Visualising the thinking process with IT Tools
- Facilitating the creation of hypermedia
3. The third type and the more advanced level focuses on pedagogy-based ICT use; the integrated use of ICT in subject curricula and classroom teaching and management, online collaboration and networking.

Singapore is the best example of both in-service and pre-service training curricula that incorporates pedagogy, i.e. teaching/learning principles and effectiveness into ICT design and development. The pre-service training focuses on technology integration in the school curriculum, and developing different approaches in teaching with technology, such as the use of ICT in constructivist learning, problem-solving and project-based learning. The in-service teacher training covers three levels: a) the basic, which uses learning resources in the virtual world, e-learning, multimedia presentations; b) the intermediate, which covers integrating ICT into curriculum, ICT tools in thinking, learning and visualizing, developing ICT-based activities; c) the advanced, including designing ICT-based constructivist activities, project-based ICT class/lesson and cutting-edge technologies in education.

South Korea’s training contents begin with the use of ICT in teaching specific subjects where the trainees select and analyse a subject into which ICT will be integrated; apply ICT models into these subjects and require teachers to develop and evaluate their own ICT-based class.

The approach employed by Coca-Cola’s eLearning for Life initiative in Malaysia begins by revisiting a specific lesson plan, improving, building and enriching it not only with ICT, but with appropriate pedagogy/teaching and learning principles, after which the developed lesson is integrated into the subject curriculum. The strategy or principle usually followed is to empower the lesson plans with multimedia technologies and ICT.

The Intel Corporation follows the same strategy in their training contents in various Asian countries. The main goal of the training is for teachers to develop a unit plan template on a particular subject, a portfolio rubric and a sample unit portfolio of ICT-based lessons. All of the tools and software learned, as well as outcomes (multimedia presentations, publications, websites, assessment tool, handouts, templates, worksheets,
and classroom management documents) developed during the training are integrated into the teaching of a unit plan of a specific subject.

Below is a synthesis of these contents offered by various countries at the more advanced stage:

a. **ICT and pedagogy integration (Instructional technology and use in various models of teaching/learning as well as design and principles for integration into subject curriculum and classrooms)**

- Technology and instructional concept and design and application to teaching/learning principles/models
  - Instructional strategies and learning effectiveness
  - ICT-based tools for designing constructivist activities; project-based work; building critical thinking skills; collaborative activities; interdisciplinary project work; other interactive multimedia-based activities to empower the learners as a whole
  - ICT-based activities to support differing learning styles and those with special needs
  - Instructional media design and multimedia design based on various learning principles
  - The Internet as a pedagogical innovation
- **Principles for integrating ICT into the classroom**
- **Curriculum mapping**
- **ICT use in creating problem-based curriculum**
- **Planning and developing a technology integrated lesson (curriculum enrichment)**
  - Analysing a subject and/or reviewing a lesson plan of a specific subject and planning to incorporate effective teaching/learning principles and the use of ICT
  - Improving or creating an ICT-based lesson plan (empowering subject/lesson plan with ICT); or preparing unit lesson plan template, portfolio rubric and sample unit portfolios of lessons
  - Locating resources from the Internet; CD, etc. for the sample unit/lesson plan
Creating subject unit/lesson plan support materials (spreadsheets, multimedia presentations, publications, student and teacher's support materials, grade book worksheet, creating student database; websites, videos, PowerPoint, etc.)

Putting a lesson plan together

Assessing lesson plans

Planning on how to integrate the improved lesson into the teaching of a specific subject

Best practices and ICT models of technology integration

Integrating telecollaboration and online discussion forums into existing curriculum

Teaching and classroom management

Introduction to a One-Computer classroom

The Next Wave: Cutting-edge Technologies in Education

b. Integrating ICT into teaching specific subjects

Use of ICT in science

How ICT improves the teaching/learning of science or how to improve science teaching through intelligent and informed use of technology

Searching and using Internet resources for science materials and lessons

Science education on the Internet

Use of computers software and calculators for science teaching

Use of computer to simulate scientific phenomena and use of graphic calculators to collect and analyse data

Constructing technology-enhanced lessons or lesson plans within a science curriculum

Use of ICT in mathematics

How ICT improves the teaching/learning of mathematics or how to improve mathematics teaching through intelligent and informed use of technology

Searching and using Internet resources for mathematics materials and lessons
- Use of computer software and calculators for mathematics teaching
- Use of computers and graphic calculators to collect and analyse data and to build and test mathematical models of the real-world
- Constructing technology-enhanced lessons or lesson plans within a mathematics curriculum

- Use of ICT in language arts
  - How ICT improves the teaching/learning of language or how to improve language teaching through intelligent and informed use of technology
  - Searching and using Internet resources for language materials and lessons
  - Searching literature-based, creative writing, problem-solving Internet projects with the option of using interpersonal exchanges, virtual gatherings, peer feedback or mentoring to support student learning.
  - Constructing technology-enhanced lessons or lesson plans within a language art curriculum

- Use of ICT in social studies
  - How ICT improves the teaching/learning of social studies or how to improve social studies teaching through intelligent and informed use of technology
  - Searching and using Internet resources for social studies materials and lessons
  - Searching problem-solving, enquiry and creative thinking materials with the option of using interpersonal exchanges, virtual gatherings, peer feedback or mentoring to support student learning.
  - Constructing technology-enhanced lessons or lesson plans within a social studies art curriculum
  - WebQuests

- Use of ICT in health education and PE
- Use of ICT in chemistry
- ICT and multicultural education
Integrating technology into K-12 classrooms
- Reviewing available instructional technologies and models of technology use in the classroom
- Understanding the benefits of incorporating technology into education
- Technology integration - planning and implementing technology use in the classroom
- Classroom management
- Evaluating lesson plans that integrate technology
- Understanding classroom management issues
- Integrating the Internet and other resources into elementary classrooms (search techniques, safety, ethical/legal issues, evaluating websites, teacher and student Internet resources)
- Software evaluation and integration in classrooms
- Creating a technology-enhanced lesson or a teacher/student project
- Web page development for teachers

Teaching with educational software and other applications
- Teaching with WebQuests
- Logo
- Science software such as Redshift, Eco Ranger, Dynamic Rain Forest, Thinking Science, etc

Use of software that employs simulators to simulate experiments for interactive activities in physics, science, etc

Assessment and evaluation - Understanding and evaluating students’ learning in an ICT environment and measuring ICT impact and effectiveness

c. **Use of online communication tools**
- Information literacy
- Online learning environment
- Online communication tools - the website as a pedagogical communications tool
The Internet
- Introduction to telecommunications, primer on the Internet and the World Wide Web
- Useful Internet resources
- Using Internet tools, search engines, e-mail, etc.
- Dealing with Internet information (safe access and Acceptable Use Policies; copyright issues; evaluating and citing online resources)

Collaborating online (telecollaboration)
- Joining a collaborative project online
- Online search for telecollaborative projects
- Schools online project updates
- Designing telecollaborative projects - steps in designing and implementing; analyzing a telecollaborative project; creating a telecollaborative project website; publicizing telecollaborative projects
- Project-based learning
- Creating a pilot e-mail project
- List server simulation
- Creating an electronic mailing list
- Using online experts to enhance student interest and learning

d. Technology management and installation

Troubleshooting
- Approaches and techniques/tips for troubleshooting (peripherals, networks, backups)
- Operating system configuration
- Hardware and software basics
- Computer maintenance and preventive measures (utilities, viruses)
- Technology resources and repairs (Internet resources for troubleshooting)
- Installation of memory chips
- Preventive maintenance and repair strategies
- Report of a troubleshooting experience
Essentials of networks (LAN)
Setting up an Intranet
Setting up, installing and using Linux
Zipping and unzipping

e. Linking schools with the community
- The schools and the community: challenges and opportunities for linking through technology
- What are telecentres?
- Setting up telecentres in schools (needs assessment, designing and setting up, disseminating)

Other trends
4. Introduction sessions to motivate - Some training courses have gone directly to training on basic computer literacy and software without first introducing the teachers and other staff to the rationale and justifications for the use of ICT to improve teaching/learning or situating ICT use in their own classroom environment. Thus, after the training sessions, teachers go back without being convinced and motivated enough to use the new knowledge and skills that they have learned. Ideally, training courses should have the following introductory sessions, as a number of countries, such as Singapore, have included in their training courses:

- Introduction to ICT and its application in education
  - Role of ICT in teaching methodology renovation (ICT and pedagogy)
  - New roles of teachers in the ICT environment
  - Selecting strategies/technologies for teacher training

- ICT and pedagogy
  - Pedagogical principles for integrating ICT into classrooms
  - Curriculum mapping
  - Utilizing technology in creating problem-based curriculum
  - Building critical thinking skills in the classroom
  - Constructivism in the classroom
• Creating units to support differing learning styles – multiple intelligences
• The Internet as a pedagogical innovation

5. Training of administrators - An increasing number of countries are starting to include administrators like principals and supervisors in their training courses, since their role is pivotal to the success of a school ICT endeavour in terms of support, especially to teachers. Examples of training course contents offered by the Coca-Cola-sponsored training course in the Philippines, with some additions from other programmes include:

- An overview of ICT use in education and introduction to instructional technology
- Drivers of and barriers to use of ICT in education
- Strategic planning, developing an ICT in education vision
- The need for a technology plan in schools – architecture and infrastructure, functions, services and capabilities
- Role of school administrators
- Issues in teacher training and professional development
- Technical sustainability
- Identifying opportunities to apply ICT and designing ICT strategies
- Policy on appropriate ICT use
- Creation of Acceptable Use Policy
- Information literacy and telecollaborative learning
- Financing centre operations
- Partnerships, community mobilization and strategies for resource generation
- Monitoring and evaluation
- Basics of WWW, e-mail, distance learning, etc.

6. A few programmes (Edventure in the Philippines and World Links) tend to place emphasis on teaching the teachers with online communication tools and project-based learning and telecollaboration, optimizing the value of e-mail and the Internet for discussions and collaborative activities.
7. One programme (World Links) went beyond the use of ICT in schools and included a session on how telecentres can be built and maintained in schools for community use. This shows how the schools which are more equipped with trained personnel and facilities can help communities harness the use of ICT in order to improve their lives and daily activities.

8. A training course on ICT does not necessarily have to be entirely computer-based. Some training programmes (SEAMEO INNOTECH) do not only develop skills in producing computer-based products but still include print, video and multimedia production focusing on media design and techniques, development and production presentation, as well as various digital tools for teaching.

E. Mode of Delivery

Almost all countries in the region and the majority of the training programmes reviewed provide training on a face-to-face mode. Clearly, the value of face-to-face training is still highly acknowledged in the region. Also, running online courses can be costly and difficult to manage in countries where little experience and skills in this area are still the rule rather than the exception.

Only two countries reported of a combination of face-to-face and online modes – the IBM-sponsored training course in Viet Nam and South Korea, where the evaluation of learning is done online, while the rest of the training is face-to-face.

Purely online courses are run by commercial companies and educational foundations on the Internet. Examples of these are Microsoft’s ActDen, PBS, Bellanet iTrain – whose modules can be accessed on the Internet and are either open source or one needs to register and enroll. PBS provides online, informal self-paced lessons and online formal professional development within supervised learning communities.

F. Methodologies Used

Countries usually employ a combination of teaching methodologies. The more common ones that are usually used together include lectures/presentations, discussions, group work/activities, computer hands-on and practicum.
Other methodologies employed are:

- Project-based learning with teachers working in teams
- Constructivist learning approaches where learners are encouraged to participate in a generative learning experience by participating in small group discussions, paired projects, peer review activities
- Simulations
- Hands on experience with technologies
- Demonstration
- Peer discussion
- Brainstorming
- Collaboration
- Joint planning

One curious questionnaire completed by Mongolia reported of a teacher training session on using PCs in teaching (includes PC structure, operating systems, word processing, spreadsheets) where the methodologies used include lectures/presentations only.