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Author(s)	Koh Thiam Seng
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IT Masterplan Implementation at the National Institute of Education: An Overview

Koh Thiam Seng
National Institute of Education
Nanyang Technological University

Introduction

On 28 April 1997, the Minister for Education, RADM (NS) Teo Chee Hean, launched the masterplan for IT in education; a plan that outlines a comprehensive strategy for establishing an IT-based teaching and learning environment in Singapore schools (Teo, 1997). This plan is one of the key initiatives to ensure that the students, the future workers of Singapore, are equipped with critical skills to face the challenges of working in a constantly changing technological environment that will be increasingly knowledge driven. These critical skills to be acquired include creative thinking, the ability to learn independently and continuously, and effective communication.

The National Institute of Education (NIE) is the sole teacher-training institution in Singapore. Under the IT Masterplan, the Institute has been given the task of ensuring that all graduates from the initial teacher training programmes are equipped with the necessary IT skills and pedagogy to enable them to function effectively in an IT-enriched environment.

This paper briefly outlines the IT Masterplan implementation efforts at the NIE. The implementation identifies curriculum revision, human resource development and physical & technological infrastructure development as the three focuses, which in turn need to be built upon a foundation of research and development on IT in education.

Background on NIE

Before discussing the IT Masterplan implementation at the Institute, some background information on the Institute is given below to provide the general context of the implementation.

The NIE is a university institute within the Nanyang Technological University. The Institute is headed by a Director and comprises four faculties, namely, the Schools of Arts, Education, Physical Education and Science. Each faculty, headed by a Dean, is organised into departments according to subject disciplines. For example, the School of Science comprises the Divisions of Biology, Chemistry, Mathematics and Physics.

As a university institute, it offers both academic and professional programmes (National Institute of Education, 1998). The main programmes are grouped into initial teacher training, further teacher training, graduate training and continuing education. The entry requirements and the duration of the initial teacher training programmes are summarised in Table 1. Some examples of further teacher training programmes conducted at the Institute include the Diploma in Divisional Management for Head of Departments in the Singapore schools and Diploma in Educational Administration for vice-principals/principals. The Institute offers graduate programmes by coursework and dissertation, or by research. These programmes include Masters and Doctor of Philosophy in a range of subject disciplines in the Arts, Education, Physical Education and Science.

Table 1: Entry Requirements and Duration of Academic Programmes

Programme	Entry Requirements	Duration
Postgraduate Diploma in Education	Recognised Degree	1 Year
Postgraduate Diploma in Education (Physical Education)		2 Years
Bachelor of Arts with Diploma in Education (including specialisation in Physical Education)	GCE 'A' Level	4 – 5 Years
Bachelor of Science with Diploma in Education (including specialisation in Physical Education)		
Diploma in Education	GCE 'A' Level Polytechnic Diploma	2 Years
Diploma in Physical Education		

IT Masterplan Implementation at NIE

Under the IT Masterplan, the Institute is charged with the integration of IT into the initial teacher training programmes. This includes:

- revising the curricula for these programmes;
- developing the human resource infrastructure;
- upgrading of the physical and technological infrastructure and;
- strengthening research and development efforts in the use of IT in education.

Curriculum Revision

In revising the curriculum to meet the requirements of the IT Masterplan, the Institute has to ensure that the student-teachers that graduate from the initial teacher training programmes are equipped with the necessary skills to integrate IT into their school curriculum subjects. The curriculum revision undertaken is summarised in Table 2. Wong (1998), in his paper, gave the philosophy and teaching approach adopted in the 30-hour foundation course. He also discussed the reconceptualisation of the foundation course curriculum in response to the IT Masterplan requirements and provided examples of students' projects arising from the course. All IT components of the curriculum are reviewed annually and revised to incorporate both the changes in educational practices and development as well as advances in instructional technologies.

Development of Human Resource

The complete infusion and integration of IT into the Institute's curriculum requires a suitable training plan to raise the general level of IT knowledge, experience and competencies among all staff at the Institute. This training plan must initiate the process of making the long-term transition from the present teaching and learning environment to an IT-integrated educational environment. Ultimately, the Institute aims to make all academic staff into role models in the use of IT in education.

A NIE IT Committee has been convened by the Director of NIE to oversee and steer the IT Masterplan implementation at the Institute. This committee comprises key personnel from the NIE Schools and administration. The functions of the NIE IT committee are to:

- Monitor the implementation progress at each NIE schools and IT utilisation within the Institute.

Table 2: Curriculum Revision that Incorporate IT in Teaching and Learning

Course ¹	Brief Description of Topics	Contact Hours
IT Skills	<ul style="list-style-type: none"> • Word processing • Presentation software • Web publishing • Spreadsheet • Multimedia authoring 	N.A. ²
Foundation	<ul style="list-style-type: none"> • Instructional planning • Principles and applications of visual design • Modes of computer-based learning • Selection and criteria for evaluation of computer-based learning packages. • Computer tools for higher order and creative thinking. • Use of the Internet in education. • Application and design of multimedia/ hypermedia in education • Theories of learning and computer-mediated instructional technologies 	30
Curriculum Studies 1	<ul style="list-style-type: none"> • Design of classroom activities for IT-based teaching and learning of school curriculum subjects. • Integration of CD-ROM packages and Internet resources into the teaching of school curriculum subjects. 	6 - 12
Curriculum Studies 2		6 - 12
Curriculum Studies 3		6 - 12
Total		42 - 54 or 48 - 66³

Notes:

1. The student teachers are trained to teach 2 school curriculum subjects for secondary level and 3 school curriculum subjects for primary level. These subjects are denoted as Curriculum Studies 1, 2 and 3 in the above table.
2. These courses are conducted outside curriculum time and are out-sourced to IT training organisations/companies.
3. The figures shown are for the secondary and the primary teaching programmes respectively. These figures refer to the total contact hours for the IT components in the Institute's courses excluding the contact hours for IT skills training.

- Ensure effective deployment of resources across the NIE schools.
- Facilitate the sharing of IT-related expertise across the NIE schools.
- Facilitate collaboration at the Institute level with external organisations especially the Ministry of Education.

The actual implementation of the IT Masterplan is carried out at the NIE School level. The Dean of each NIE School has convened a School IT Committee. The chairman of the School IT Committee is designated as the School IT Coordinator and represents the School on the NIE IT Committee. Each division nominated one or two academic staff who are already familiar or most familiar with the use of technology to be Divisional IT Coordinators. These latter coordinators represent their respective divisions on the School IT Committee.

The building of the human resource infrastructure adopted a gradual “fan” process. The leaders in the use of IT in education generally conducted informal training sessions for the Divisional IT Co-ordinators. These IT co-ordinators, in turn, would develop an appropriate training programme that best fits the needs of their respective divisions and share their experiences with their colleagues accordingly.

At this phase of IT Masterplan implementation, the training take several modes. It include:

- Sharing sessions on the use of IT in teaching
- Hands-on workshops and seminars
- Just-in-time support

The sharing sessions expose academic staff to some of the approaches taken by the IT co-ordinators in using IT to teach their respective subject areas. Workshops provide the academic staff with training in the use of various presentation and development tools. The seminars provide input on theoretical frameworks, models and principles of the use of IT in education and examples of best practices from around the world. These latter seminars are generally conducted by international experts in the field of IT in education.

An IT support group was also established in each school to provide consultation and technical assistance to academic staff in their endeavour to apply IT to their teaching. This support group comprises the Divisional IT coordinators in the school, an academic computing specialist and computer laboratory technicians. The IT coordinators in the group generally offer suggestions and ideas on pedagogy relating to the use of IT in education. The academic computing specialist and the computer laboratory technicians provide technical assistance, which include the sourcing and management of computing resources and facilities and the development of customised software. The Divisional IT coordinators are the catalysts in the integration of IT into the curriculum as they provide crucial just-in-time suggestions and ideas on the use of IT in their respective subject areas to their colleagues.

Physical and Technological Infrastructure

With the IT Masterplan budget, the Institute was able to upgrade its existing physical and technological infrastructure at Bukit Timah Campus to meet the requirements of equipping the student-teachers in the initial teacher training programmes with the necessary skills to integrate IT into their school curriculum

subjects. Only a modest upgrading of infrastructure was undertaken because of two considerations. They are:

- The Institute will be moving to the new Yunnan Garden campus at Jurong in 2000/2001.
- The existing level of IT knowledge, experience and competencies among academic staff members at the Institute.

The upgrading of infrastructure that was carried out includes:

- Addition of 8 new computer laboratories and upgrading of existing computer laboratories. This addition of computer laboratories increased the total number of laboratories available on campus for teaching to 16. Each computer laboratory is equipped with Pentium-based multimedia computer systems; 20 for students' use and 1 for the instructor. Other standard equipment provided include a colour printer, a laser printer, a scanner, a visualizer and a LCD projection system.
- Upgrading and addition of networking services to support academic computing. These services include, for example, support for web-based education and a client-server environment for online collaboration and exchange of information.
- Provision of 40% of IT-ready lecture/tutorial rooms. An IT-ready room is equipped with at least an Internet connection and a LCD projection system.
- Provision of an adequate number of notebook computers for teaching in the IT-ready rooms.

Research and Development

The infusion and integration of IT in education is an expensive enterprise. Although the use of IT in education is not new to the Institute, teaching and learning in an IT-enriched environment is a relatively new endeavour. The Institute will need to undertake research in and with IT in order to remain relevant and become an educational leader in teacher education in the 21st century. Being the sole teacher training institution, it is important for the Institute to engage and lead in the research and development on IT in education particularly in computer-mediated pedagogy.

It is not always possible to transplant in total the results of research done or the experience acquired in countries such as the US or Europe for implementation in the Singapore school system. The cultural context in Singapore differs markedly from that in these countries. The products of research or experience from these countries have to be adapted and modified to suit the local conditions.

Under the IT2000 Masterplan, the government wishes to encourage an educational courseware development industry in Singapore (National Computer Board, 1992). The development of this courseware industry requires the education and training of local manpower to support such an industry. The Institute, with its experience and expertise in the Singapore education system, is primed to contribute towards this development of local expertise in the country.

In time, with the Singapore government's commitment to building a world-class IT infrastructure as envisioned in the Intelligent Island concept (National Computer Board, 1992) and the recent Ministry of Education's IT Masterplan's initiative (Tan, 1998), Singapore will be primed to take a leadership position on IT in education. This position implies that, in the near future, the Singapore education system will not be able to leverage the research and development on instructional science and technology done by other countries. Singapore will need to rely more on local expertise to push the frontier of instructional science and technology further. Hence, it is important that the Institute begins a systematic process of building a strong research and development foundation in preparation for the time when Singapore needs to rely extensively on local expertise to maintain a competitive edge in a knowledge-driven economy.

The Institute has set the following research thrusts:

- Examination of issues relating to IT integration in the context of Singapore schools.
- Experimentation with emerging IT-mediated pedagogies for eventual widespread adoption by the Institute and the schools.
- Development of design methodologies and prototypes of interactive multimedia applications for education and training.
- Exploration of the development of IT-based productivity tools to enhance education and training.

The Institute has initiated projects in the first three research areas. These projects are either funded research projects undertaken by academic staff or projects undertaken by postgraduate students in fulfillment of their degree requirements. The Institute has also mounted a new Masters in Instructional Design and Technology degree programme, which commence in January 1999, for teachers in the schools and tertiary institutions and trainers in industry (School of Education, 1998).

Concluding Remarks

The main challenge in the implementation of the IT Masterplan at the Institute is the development of the human resource infrastructure. In order for the implementation to be successful, two important points should be noted.

First, the power of IT to enhance and enrich education does not lie solely on the powerful computer systems or high bandwidth networking infrastructure that are made available. It is the teacher's creativity and understanding of the educational processes and practices that will enable the teacher to use IT to enhance and improve learning.

Second, there must be a pervasive IT culture within the institution. Academics, administrators and student-teachers must be prepared to change their mindset in terms of how instructional and administrative matters are viewed and actualized. They must be open to the technology and be able to adapt to the changes that the technology will bring about. They must be willing to learn and adopt the new technology whenever appropriate.

On the basis of the lessons learned in the past 20 months, the Institute has focussed its attention on addressing the development of the human resource infrastructure in the next phase of the IT Masterplan implementation. The Institute is in the midst of setting up a formal organisational structure to deal with the human resource development and put in place key strategies that will eventually make all academic staff into role models in the use of IT in education.

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