A Conducive Classroom Environment for IT Integration: A Collective Case Study of Primary Schools in Singapore

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Abstract
This paper discusses the findings of the collective case study of two primary schools in Singapore. It is part of a larger funded research project that examines and analyses where and how IT is integrated in Singapore schools to develop pupils' higher order thinking skills. The focus of this paper is on the IT classroom management issues that create a conducive environment to support the effective integration of IT in the schools. In such an environment, pupils are more likely to be task-oriented and reflective, and hence, more likely to engage in higher order thinking. These issues include the establishment of rules and procedures, availability of IT resources, conduct and management of IT-based activities, and division of labour among participants.

In Singapore, the Master Plan for ICT in Education was launched in April 1997. As part of this plan, all Singapore schools are expected to acquire and integrate ICT in their curriculum so as to develop a culture of thinking, lifelong learning and social responsibility. Based on the implementation progress of the ICT Master Plan, it is an appropriate time to study the integration of ICT in schools as the process of integration has reached a considerable level of maturity and stability for evaluation purposes.

This article reports and discusses the findings of the case study of two primary schools in Singapore. The focus of this article is the discussion of ICT classroom management issues that create a conducive environment that supports the effective integration of ICT in the schools. In such an environment, pupils are more likely to be task-oriented and reflective, and hence, more likely to engage in higher order thinking. These issues include the establishment of rules and procedures, conduct and management of IT-based activities, and division of labour among participants.

The Case Studies: East Primary School and North Primary School
To provide an in-depth examination of the ICT management issues that support the effective integration of ICT in schools, case study research is the most appropriate tradition of inquiry. The 'cases' for the study in this article were 2 primary schools in Singapore, East Primary and North Primary School. The 2 schools were selected based on their high degree of ICT integration reported in the questionnaire survey distributed to all Singapore schools. To ensure the accuracy of conclusions drawn, the data from the observations of ICT-based lessons, face-to-face interviews with teachers, head of department (HOD), and principal, focus group discussions with pupils, and pupils' questionnaire were used in the multiple strategies process. Multiple strategies involve gathering accounts of different realities that have been constructed by various groups and individuals in the school; and hence, enhance reliability and validity of the study.

The study in East Primary School, a government-aided school, was carried out between 17 and 27 September 2001. At the time of the study, there were 2118 pupils, consisting of boys and girls with ages ranging from 7 to 12. The school has a teaching staff strength of 80 with 10 support staff, including a computer technician. There were 2 computer rooms where each has been equipped with about 40 computers, data projector, pull-down projector screen and whiteboard. The ICT learning packages used included Midisaurus for Music, I-Micro and RoboLab for Science, and a wide range of CD-ROMs for the other subjects. The school also converted certain areas in the school into free access corners with a total of 12 computers for pupils to engage in independent learning.

The fieldwork in North Primary School, a government-aided school, was carried out from 21 August to 4 October 2001. All 720 pupils were girls between 7 to 12 years old. There were 31 teaching staff and 9 support staff, including a computer technician. There was 1 computer room with about 40 computers, data projector, pull-down projector screen, whiteboard and 2 printers. The ICT learning packages used included Midisaurus for Music, Crayola for Art, and CD-ROMs such as MathBlaster and ZARC for Mathematics.

Establishment of Rules and Procedures
Although the rules and procedures established in a non-ICT based classroom apply in an ICT-based classroom, there are additional rules and procedures to be established in the latter. This is due to the addition of computers, printers, monitors, CD-ROMs and other ICT resources. The rules are generally set up to prevent the abuse of the hardware and software in the computer room. In both schools, the rules of the computer room were clearly displayed on the wall. They included no water bottle or food in the computer room, no unauthorised installation of program, and no unauthorised change to the features of the control panel.

It is also important to establish procedures for pupils to follow, as this will minimise the occurrences of deviant behaviour among pupils and keep the pupils on task.
Some procedures that were observed in both schools included the following:

- Pupils entered and exited the computer room in an orderly fashion according to their class index number. Each of them knew their assigned seats and there was no rushing.
- A procedure of distributing and collecting ICT resources (e.g. CD-ROMs, diskettes) were set up in both schools. Teachers enlisted pupil helpers (they were called group leaders) to carry out this procedure for a conducive learning environment.
- Pupils turned on the computers only when the teacher gave instructions. In North Primary School, some teachers would get the pupils to turn off their monitor when they were explaining a concept or giving instructions at the front of the class. These procedures ensured that the pupils paid attention to the instructions and explanations. When such a procedure was not established, a few pupils in East Primary School were observed to be not paying attention.
- In East Primary School, a red cup was placed beside each computer to allow pupils to signal for help. When pupils encountered a technical or instructional problem, they would place their cups on top of their monitors to request for help. As the use of such cups was absent in North Primary School, the pupils who encountered problems have to raise their hands and that disrupted or delayed the completion of their tasks.
- In the pupils’ questionnaire, more than 80% of the pupils from both schools strongly agreed or agreed with the rules and procedures established by the teacher in the computer room. Both teachers and pupils in their respective interviews and discussion groups stated that these rules and procedures ensured a more conducive environment for learning.

**Conduct and Management of ICT-Based Activities**

Pupils cannot be assumed to be ‘expert’ learners in the ICT-based learning environment. They may lack the technical skills to operate and navigate through the ICT learning package; they may lack the learning skills to learn in such an environment; or/and they may lack the motivation to learn using the ICT learning package. Teachers need to conduct and manage the ICT-based activities such that the assumptions of the ‘expert’ learners are addressed. Such conduct and management of ICT-based activities were observed in both schools:

- Pre-instructional activities were conducted in both schools. Most of the teachers reviewed previous concepts and made links to the concepts to be covered in the ICT-based lessons. Some teachers highlighted and demonstrated the key features and the navigation buttons of the ICT learning package before allowing pupils to start using the computers.
- Most of the instructions of the ICT-based activities were clear in both schools. When pupils were clear about the tasks that they were to complete, they were more likely to be task-oriented and motivated. When instructions were confusing, as observed in a lesson in North Primary School, pupils were found to display more deviant behaviours.
- Most of the ICT-based lessons observed in both schools were pupil-centred with very little direct teaching. There were only 2 lessons observed in East Primary School where more than two-third of the lesson was spent on direct teaching. In these 2 lessons, many pupils were observed to be distracted and a few were caught fiddling with the keyboards and the mouse.
- Scaffolding activities were present in most lessons observed in both schools. Worksheets and checklists were distributed to the pupils to guide them to complete their tasks. Such scaffolding ensured that pupils were able to successfully engage in the tasks and complete them.

**Division of Labour among Participants**

The responsibility of ensuring a conducive learning environment should not fall entirely on the teacher. There is a need for the division of labour among the participants in the computer room. The role of the teacher in the 2 schools was to plan for the ICT-based lessons, conduct and manage them, evaluate them and make necessary changes. They moved around the computer room to engage the pupils in dialogues while the pupils were working at the computers. However, it was observed that there were also the crucial roles of the computer technicians and the pupil helpers.

- Role of computer technician: In both schools, the technicians were present in all ICT-based lessons observed. They helped the teachers to address technical problems faced by the pupils. By doing so, the technicians freed the teachers from attending to technical problems and ensured that they focused their attention on the conduct and management of the ICT-based lessons.
- Role of pupil helpers: In both schools, group leaders and assistant group leaders were assigned to collect, distribute and return CD-ROMs, diskettes, worksheets and checklists. Their roles facilitated the smooth running of the lessons that created a conducive learning environment.

Managing ICT-based lessons is not very different from managing non-ICT based ones. The basic classroom management principles apply for both. As the case studies have highlighted, there is a need for the establishment of rules and procedures for the computer room, the proper conduct and good management of ICT-based activities, and the division of labour among teachers, technicians and pupils. It is only then that a conducive learning environment is created to set up the necessary condition for the effective integration of ICT in schools.