Integration or transformation?

A cross-national study of information and communication technology in school education

by

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This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief, it contains no material previously published or written by another person except where due acknowledgment is made in the text.

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Abstract

The advent of relatively cheap micro-computers in the 1980s has led to major investment in information and communication technology (ICT) for schools. The technology has been developed continually, creating a situation where there may be significant differences between policy and practice. The literature relating to innovation diffusion and the rationale for ICT in school education has concentrated upon effectiveness and teacher professional development. Existing models of development in the area are limited in scope or make ill-founded assumptions. Little work has been done on the question of alignment between policy and practice.

This study used a grounded theory approach to examine the relationships between policy, implementation and underlying models of development. This was done through a process of policy comparison, consultation with experts in the field and case study observations. The methodology used a comparative case study approach at national, school and classroom levels and examined issues such as the nature of development processes for policy in the area, implementation and practice in the use of computers in classrooms, teacher professional development and stages of development as perceived by practitioners. Data were gathered from the United States of America, England, Estonia and Australia from November 1999 to September 2002.

The study found ICT curriculum approaches for students were strongly aligned with a stage of development which emphasised the integration of ICT into existing curricula and current classroom practice. There was poor alignment between overlapping policies for teacher training and student learning outcomes and also between policy and classroom practice. It was confirmed that students generally have better access to computers outside school than within it, a situation largely ignored by policy. It was also found that experts in the field perceived increasing reliance upon generic office software as an outmoded ‘tool’ approach, and saw ICT as a ‘driver’ for transformative change in school education. School and classroom observations confirmed that local practice included transformative uses of ICT.
From these findings a general model of stages of development was derived. The model consisted of an introductory Phase 1, where students in school first use computers and information technology becomes a subject choice; an integrative Phase 2, where information and communication technologies are used to enhance learning opportunities in all traditional curriculum subject areas; and a transformative Phase 3, where the curriculum clearly includes topics of study that would not exist without information and communication technologies and schooling for most students no longer fits the traditional group-instruction model.

The model has implications for alignment in policy development based upon a national cross-curriculum framework. It demonstrates the importance for teacher professional development to include training in virtual teaching and the evaluation of digital materials. In particular, there is a need to examine the alignment between conventional learning outcomes, policy and practice when ICT is much more available to students outside school than within.

The study provides guidance for future policies concerning teacher ICT professional development and argues for their alignment with national cross-curriculum frameworks for ICT in school education. It will also be useful for educators training pre-service teachers to use and prepare online digital learning materials. Further, the study also informs school communities about the need to use ICT as a way of linking their institution with student homes and to extend learning opportunities.
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Glossary and acronyms

ABS       Australian Bureau of Statistics
ACCE      Australian Council for Computers in Education
ACOT      Apple Classrooms of Tomorrow
ACSA      Australian Curriculum Studies Association
AEC       Australian Education Council
ALTP      Arizona Learning Technology Partnership
Bandwidth The communication capacity of a link between computers: measured in bits per second
Becta     British Education Communications and Technology Agency
Bit       Binary Digit: the smallest piece of data stored in a digital computer system
Broadband Technically, a communication link which carries more than one kind of data at a time. Common usage for a link with bandwidth greater than 200 kbits/second in each direction
Byte      Sufficient bits to store a letter of the alphabet or similar character: generally 8 bits
CAD/CAM   Computer Aided Design/Computer Aided Manufacture
CARTS     Computerised Assessment Recording and Time-tabling System (Tasmania)
Computer  A universal machine for processing information
DETYA     Department of Education, Training and Youth Affairs (Commonwealth of Australia)
EC        European Community/European Commission
ECDL      see ICDL
EdNA      Education Network Australia
ERIC      Educational Resources Information Center (Syracuse University/Federal Department of Education, USA)
EU        European Union
FBI       Federal Bureau of Investigation (USA)
GCSE      General Certificate of Secondary Education (UK)
Hardware  Equipment comprising and associated with a computer system
HMI       Her Majesty’s Inspectorate
IBM PC    International Business Machines Personal Computer or a clone thereof
ICDL/ECDL International (European) Computer Driving Licence
ICT       Information and Communication Technology/ies
IEA       International Association for the Evaluation of Educational Achievement
ILS       Independent Learning System
INSET     In-service education and training
Internet  A network comprising connected computers around the world
IRT       In-school resource teacher (Tasmania, Australia)
ISTE      International Society for Technology in Education (USA)
IT        Information Technology
ITEC      Information Technology in Education and Children (UNESCO)
KEDI      Korean Educational Development Institute
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>KITO</td>
<td>Key Information Technology Outcomes (Australia)</td>
</tr>
<tr>
<td>KLAs</td>
<td>Key Learning Areas (Australia)</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
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<tr>
<td>MCEETYA</td>
<td>Ministerial Council on Education, Employment, Training and Youth Affairs (Australia)</td>
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<tr>
<td>MEP</td>
<td>Micro-Electronics Education Programme (UK)</td>
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<tr>
<td>MESU</td>
<td>Micro-electronics Education Support Unit</td>
</tr>
<tr>
<td>MOO</td>
<td>Multi-User Object-Oriented (a kind of multi-user role-playing environment)</td>
</tr>
<tr>
<td>NCATE</td>
<td>National Council for Accreditation of Teacher Education (USA)</td>
</tr>
<tr>
<td>NCES</td>
<td>National Center for Educational Statistics (USA)</td>
</tr>
<tr>
<td>NCET</td>
<td>National Council for Educational Technology (UK)</td>
</tr>
<tr>
<td>NCREL</td>
<td>North Central Regional Educational Laboratory (USA)</td>
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<tr>
<td>NCVQ</td>
<td>National Council for Vocational Qualifications (UK)</td>
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<tr>
<td>NETS</td>
<td>National Educational Technology Standards (USA)</td>
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<tr>
<td>NOIE</td>
<td>National Office for the Information Economy (Australia)</td>
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<tr>
<td>NSW DET</td>
<td>New South Wales Department of Education and Training</td>
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<tr>
<td>NSW HSC</td>
<td>New South Wales Higher School Certificate</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OFSTED</td>
<td>Office for Standards in Education (UK)</td>
</tr>
<tr>
<td>OHP</td>
<td>Over-Head Projector</td>
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<tr>
<td>PD</td>
<td>Professional Development</td>
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<tr>
<td>PHARE</td>
<td>Poland and Hungary: Action for the Restructuring of the Economy (EC)</td>
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<tr>
<td>PHARE-ISE</td>
<td>PHARE (see above) Information Systems in Education program</td>
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<tr>
<td>QCA</td>
<td>Qualifications and Curriculum Authority (England)</td>
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<tr>
<td>QUANGO</td>
<td>Quasi-autonomous non-governmental organisation</td>
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<tr>
<td>SACS</td>
<td>School Administration Computer System (Tasmania)</td>
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<tr>
<td>SCAA</td>
<td>School Curriculum and Assessment Authority (UK)</td>
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<tr>
<td>SITES</td>
<td>Second Information Technology in Education Study</td>
</tr>
<tr>
<td>Software</td>
<td>Instructions and data controlling the behaviour of a computer</td>
</tr>
<tr>
<td>TEFA</td>
<td>Technology Education Federation of Australia</td>
</tr>
<tr>
<td>TILT</td>
<td>Technology in Learning and Teaching (New South Wales, Australia)</td>
</tr>
<tr>
<td>TIMSS</td>
<td>Third International Mathematics and Science Study (IEA)</td>
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<tr>
<td>TLF</td>
<td>Technology Literacy Challenge Fund</td>
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<tr>
<td>TLITE</td>
<td>Teaching and Learning in an Information Technology Environment (Canada)</td>
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<tr>
<td>TTA</td>
<td>Teacher Training Agency (UK)</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<tr>
<td>USA or US</td>
<td>United States of America</td>
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<tr>
<td>UWS</td>
<td>University of Western Sydney</td>
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<tr>
<td>VET</td>
<td>Vocational Education and Training (Australia)</td>
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<tr>
<td>V-LAN</td>
<td>Virtual local area network</td>
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<tr>
<td>WebCT</td>
<td>Web Course Tools (commercial company)</td>
</tr>
<tr>
<td>WGU</td>
<td>Western Governors University (USA)</td>
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<tr>
<td>World wide web</td>
<td>Inter-linked information in hyper-text format on some internet computers</td>
</tr>
<tr>
<td>YCCI</td>
<td>Young Children’s Computer Inventory Project</td>
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