PEDAGOGY AND ICT USE

IN SCHOOLS AROUND THE WORLD

FINDINGS FROM THE IEA SITES 2006 STUDY

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FINDINGS FROM THE IEA SITES 2006 STUDY

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Due to the limitation of space, some analysis results are not presented in the printed version of the report, but are made available online at http://www.sites2006.net/appendix. The following is the list of online appendices, including (a) the list of survey questionnaires, (b) the list of online tables of results, and (c) the list of online figures of results.

List of survey questionnaires

List of online tables of results

List of online figures of results

Abbreviations

BECTA	British Educational Communications and Technology Agency
CAB	Alberta Province, Canada
CAD	computer-aided design
CFA	confirmatory factor analysis
CHL	Chile
COP	community of practice
COT	Ontario Province, Canada
DNK	Denmark
DPC	IEA Data Processing and Research Center
ECT	Catalonia, Spain
EMB	Education and Manpower Bureau of Hong Kong
ERT	European Roundtable of Industrialists
EST	Estonia
EU	European Union
FIN	Finland
FRA	France
GDP	gross domestic product
GIS	geographic information system
HKG	Hong Kong SAR
HLM	Hierarchical Linear and Nonlinear Modelling
ICC	international coordinating committee
ICT	information and communication technology
ICT-EXP	Mean length of experience that schools in a system had with using ICT for pedagogical practices
ICT-TP-LLL	score for ICT-using teacher practices oriented towards promoting lifelong learning
IEA	International Association for the Evaluation of Educational Achievement
ISCED	International Standard Classification of Education
ISR	Israel
IT	information technology

ITA	Italy
JPN	Japan
LEADERSHIP	Principal's priority for leadership development
LLL	lifelong learning
LMS	learning management system
LTU	Lithuania
MPITE	Masterplan for IT in Education (Singapore)
NCES	National Center for Educational Statistics
NCQ	national coordinator questionnaire
NOR	Norway
NRC	national research coordinator
ODC	online data collection
OECD	Organisation for Economic Co-operation and Development
PC	personal computer
PD	professional development
PDA	personal digital assistant
PEDASUP	level of pedagogical support
PISA	Programme for International Student Assessment
PSTD	Programma di sviluppo delle tecnologie didattiche
RUM	Moscow, Russian Federation
RUS	Russian Federation
SAR	Special Administrative Region

Acknowledgements

From the Executive Director of the IEA, Dr Hans Wagemaker

The International Association for the Evaluation of Educational Achievement (IEA) has, for 50 years, conducted comparative research studies focusing on educational policies, practices and outcomes in more than 90 countries around the world. Organized around a secretariat located in Amsterdam, the Netherlands, and a data-processing center in Hamburg, Germany, the IEA, through its various projects, continues to study and report on widely varying topics and subject matters, including the use and impact of information technology in education. This volume reports the outcome of the IEA's most recent study in this area.

The IEA is particularly indebted to the directors of this project, Professor Nancy Law, Professor Tjeerd Plomp, and Dr Hans Pelgrum, for their leadership. We also strongly acknowledge the guidance provided by the members of the steering committee. Projects like SITES are not possible without a considerable amount of financial support. In this regard, I thank the Ford Foundation, the countries that contributed financially to this project and, in particular, the governments of Norway and Japan for their financial input. Also critical to the success of international projects such as SITES is the willingness of participating countries to commit to a set of common goals and procedures. Many teachers and principals gave willingly of their time, and for that I and my secretariat colleagues are continually thankful. Finally, I extend particular and sincere thanks to the national research coordinators, whose input has made this project a success and this volume possible.

From the Volume Editors and Authors

The international collaborative effort that is SITES 2006 was made possible through the contribution of many persons. We thank the NRCs of the 22 education systems that participated in this study (Appendix A gives names and contact details). They contributed substantially to its design, including questionnaire development. They also translated the instruments (where necessary) and collected the data from schools and teachers in their countries. We greatly appreciate the cooperation of the

schools (roughly 9,000), their principals, and the technology coordinators and teachers (around 35,000). The international coordination of SITES 2006 was run by a consortium consisting of (1) an international coordination centre at the University of Twente (Tjeerd Plomp, study director, and W. J. Pelgrum, international coordinator), (2) the University of Hong Kong (Nancy Law and her team at the Centre for Information Technology in Education, University of Hong Kong), and (3) the IEA Data Processing and Research Center (DPC) in Hamburg.

We express our sincere thanks to Christian Monseur, University of Liège, the sampling coordinator for the study, and to our colleagues at the DPC for their expertise throughout SITES 2006. In particular, we acknowledge the DPC for designing an online data collection (ODC) system that proved very well tailored for this large-scale international comparative study. This system marked the first use of ODC in the history of international comparative assessments. We also greatly appreciate the many thoughtful suggestions received at various stages of the study from Ronald Anderson and Alfons ten Brummelhuis as members of the study's international steering committee. We are particularly grateful to the gracious hospitality of our hosts during NRC meetings held outside of the study consortium: Pornpun Waitayangkoon, Somsri Tangmongkollert (Phuket, Thailand), Renata Picco, and Roberto Melchiori (Frascati, Italy).

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Series Editor's Foreword

The International Association for the Evaluation of Academic Achievement, or IEA, conducts studies in countries across the world that are explicitly comparative, but although this might be the first reason to welcome this volume into the *CERC Studies in Comparative Education* Series, it is certainly not the last. This book reports and analyses the findings of the Second Information Technology in Education Study (SITES 2006), which was conducted under the auspices of the IEA. This is the first time that a book in this series has been solely dedicated to an IEA study, so why have we decided to publish this one in particular? Well, perhaps it's about time. One of the earliest volumes in the series – the sixth, in fact, published in 1999 – was Neville Postlethwaite's *International Studies of Educational Achievement: Methodological Issues*. Seventeen volumes and nine years later, we're publishing one such study. Postlethwaite's introduction to international survey studies and engagement with methodological issues that included sampling, instrument construction, and data collection, management and analysis, contributed critical insights to this highly significant and substantial field of comparative education research, and is today viewed as one of the key methodological texts in the field. This study, reported by Nancy Law, Willem Pelgrum and Tjeerd Plomp, represents the best of what Postlethwaite set down. The editors of this book are widely recognized as among the leading scholars globally in the field of information and communications technology (ICT) in education. And Nancy Law's *Centre for Information Technology in Education* (CITE) is recognized as a leading academic centre in the field.

One of the consequences of the increasing rate of globalization has been a reconsideration of national goals of education, which in some cases has contributed to national declarations of educational purposes that indicate an apparent need for education to go beyond the teaching of knowledge and skills to preparing younger generations to contribute to innovation and problem solving as members of a team. Such changes in educational goals have also brought about changes in methods of organizing and conducting teaching and of enhancing learning, as well

as changes in roles played by teachers and learners. This book reports on a comparative study of ICT in education in the context of such global changes in policies and practices in education. Hence it is as much a book on pedagogy and changes in educational goals and practices as it is a book on ICT. The findings reported in this book will be valuable for education policy makers, practitioners, researchers and anyone else interested in understanding the changes in pedagogical practices in classrooms around the world, and the roles played by ICT in those changes. The book also sheds light on how policies and strategies at the school and system levels might influence whether and how ICT is to be used in classrooms.

In the Series Editor's Foreword to the previous volume published in this series, a month prior to the publication of this volume, I mentioned that CERC has recently been described, by the Co-Editor of the *Comparative Education Review*, David Post, as "one of the world's most important publishers of research in the field of comparative education". This volume, in its application of comparative education's research methods to the field of information and communications technology in education, is yet another reason why.

Mark Mason

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Foreword

How is information and communication technology (ICT) changing teaching and learning practices in secondary schools worldwide in the 21st-century? This is the central question addressed by researchers involved in the series of surveys comprising the Second Information Technology in Education Study (SITES). The question is a multifaceted one, with each facet raising additional questions relating to both theory and practice. These include the following:

- What traditional and new pedagogies are evident in the 21st century?
- What is the role of ICT in the teaching and learning process?
- What ICT-infrastructure is available in schools?
- How can teachers and their administrators be prepared for effective practice?
- How have these conditions and considerations changed since the first SITES survey in 1998?
- What are the trends within and between national education systems?
- What do the differences and similarities between these systems suggest?
- How should change be promoted in education in order to support teachers in their work?
- Is there evidence that key strategic factors commonly found in ICT-related educational policies do influence teachers' pedagogical use of ICT?

Because these questions are interconnected, the SITES 2006 researchers recognized that if we are to make sense of changes in pedagogical practices as a result of ICT-use, then we need to view those practices in terms of the interacting layers in the 22 education systems surveyed. The evidence presented in this report was therefore drawn from "layers" within each education system, most notably from principals and technology coordinators within the set of schools sampled for each system and from at least two mathematics and two science

teachers teaching Grade 8 classes in each school. The evidence presented here also relates to a comparison across 15 of the 22 systems between the data gathered from the 2006 survey and that gathered from the 1998 survey (Pelgrum & Anderson, 1999).

The SITES researchers took extraordinary care with the thousands of questionnaires in many languages that came out of these surveys to ensure the data they contained could be compared across levels, systems, and time. The information that has emerged from the surveys confirms the complexity of change relative to ICT in education and the need for ecological perspectives on the socio-cultural changes occurring in education worldwide. The diversity of factors that influence a teacher's adoption of ICT can also be envisioned in layers that frame perspectives of the classroom as nested within the school, the local area, the region, and the global "biosphere" of education. For example, current theoretical models describe multi-staged adoption of ICT in a classroom that stems from each teacher's current concerns, with these, in turn, inter-connected with the vision of the leader of the department and the school (Davis, 2008).

The chapters of this book have been carefully organized to take readers through three layers of educational ecologies and their interactions, and also to educate readers on the many methodological challenges that beset the SITES researchers and the ways in which they solved them. Technology also played its part in the research process, with the participating systems able to engage in online data collection if they so chose, and with researchers having access to analytical tools including relational analysis with multi-level modeling. Building on the SITES 2003 case studies of innovative practice (Kozma et al., 2003), the researchers involved in SITES 2006 categorized pedagogical practices into traditional and two complementary aspects of 21st-century pedagogy, namely lifelong-learning and connectedness.

The findings presented in this book are fascinating and valuable. If the relevant agents within each system act on the implications arising out of these findings, we should see a considerably more effective use of the very large investments made worldwide in ICT in education. It is relevant to note here that publication of this important book coincides with UNESCO's release of its ICT-competency standards for teachers (UNESCO, 2008), which in itself is a confirmation that governments, experts, and practitioners increasingly are recognizing the important role that ICT can play in supporting educational improvement and reform.

The book's recommendations not only combine well but also verify an ecological perspective that could have better informed past initiatives. For example, adoption of SITES 2006 recommendation 5, "Policies that adopt a balanced, holistic approach catering for leadership development, professional development, pedagogical and technical support for ICT-use as well as improved ICT-infrastructure in schools will be more successful than policies focusing on one or two strategic areas,"could have avoided the widely publicized challenges of inadequate leadership development and infrastructure experienced in mandatory ICT-related teacher training in the UK (Davis, Preston & Sahin, 2008). In addition, the positive effect of recommendation 5 would be amplified many times if combined with recommendation 7, which links school development into the broader curriculum framework of the system or nation, and even more so if it were to include the 21st-century student outcomes emphasized in recommendation 1.

If our society is to adjust to and avoid damaging turmoil, alienation, and the threat of disintegration, then the impact and potential of ICT must be at everyone's fingertips. In short, we all have a role in its development (Dutton, 2004). It may be impossible to change our 19th- and 20th-century education systems to serve new generations equitably, but we must strive to do so. Lifelong learning and connectedness are essential additions to education designed for the 21st century, but they will not take firm root unless they are aligned with development of appropriate ICT-related pedagogies across and within our interlinked educational ecosystems, and herein lies the importance of this report on the SITES 2006 survey. This book provides the world with an extraordinarily valuable comparative study, and I recommend it to leaders of all education systems.

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